

Ocean Mining
and
Ocean Policy

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Lorenz: Better Weather Prediction?
Eberhard: Man-Centered Standards
Keene: Lunar Photography for Apollo



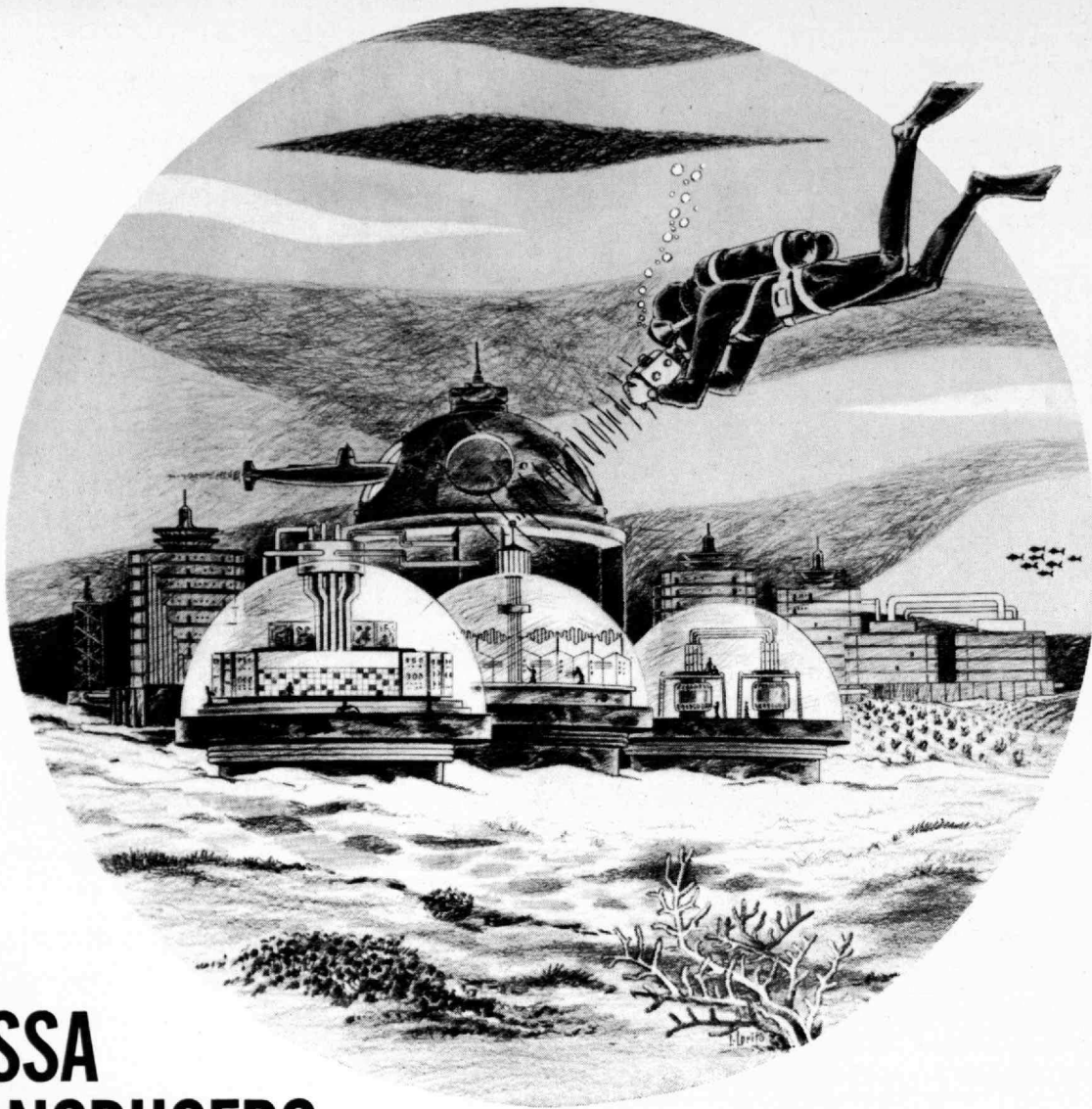
Technology Review



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Choosing a Signal Processor

by DR. E.U. COHLER, *President*
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Algorithm-specific processors are designed to perform individual algorithms of general usefulness, such as Fast Fourier Transforms. This category really consists of partial systems, since these processors must be combined with either a function-specific processor or a computer. Thus it is clear that the algorithm-specific processor, like the function-specific processor, is an inherently rigid approach.

General-Purpose

General-purpose processors are systems whose functions are programmed rather than wired. The most flexible of the three, they combine the advantage of standard hardware with a multiple function capability. Such a system may be used for any algorithm: Fourier transforms, digital filtering, correlations, convolutions, cepstra, amplitude histograms, signal averaging, spectral densities, or statistical analyses. It can also accomplish the many odd jobs peculiar to a non-specific environment: comparison, peripherals handling, display, threshold sets, adaptation, and decision-making.

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The Cover

The cover design, illustrating this issue's emphasis on the exploitation of the resources of the seas, is by Dietmar Winkler of the M.I.T. Office of Publications.

Volume 71

This issue completes *Technology Review's* 71st volume. The first issue of Volume 72, dated October/November, 1969, will appear on October 1.

An index of Volume 71 is in preparation and will be available, at no cost and upon request, at the end of the summer. Please write to the Editors at Room E19-430, M.I.T., Cambridge, Mass., 02139.

The Next Issue

For October/November, *Technology Review* announces a comprehensive series on new knowledge and new techniques in the planetary sciences. Among the contents will be:

The Modification of Planet Earth by Man
Gordon J. F. MacDonald, Vice Chancellor of the University of California, Santa Barbara

The Chemistry of the Largest Planet
John S. Lewis, Assistant Professor of Geochemistry and Chemistry, M.I.T.

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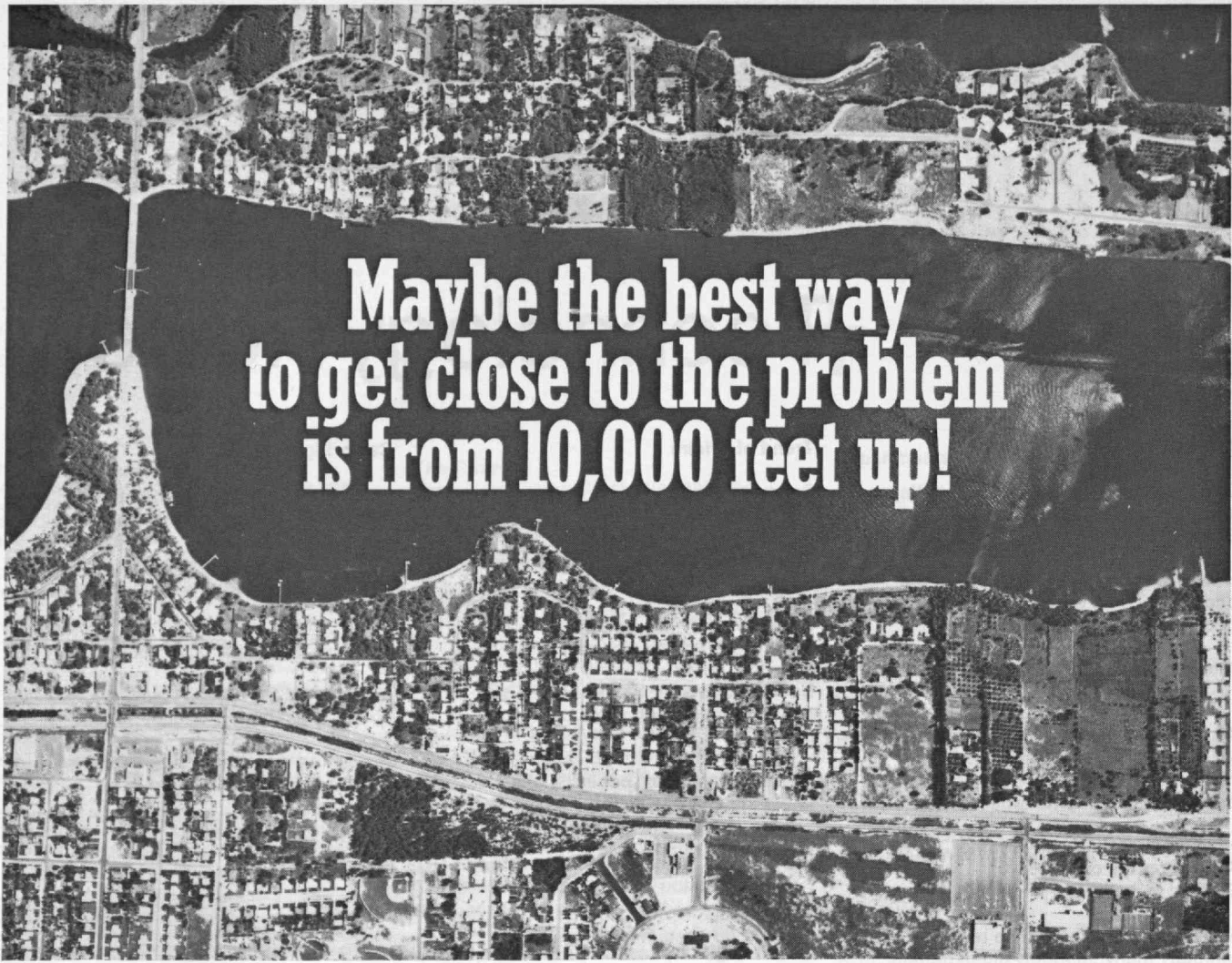
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Maybe the best way to get close to the problem is from 10,000 feet up!

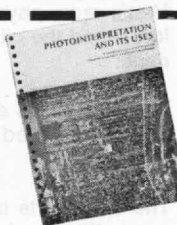
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A Matter of Life and Death

With more than a hundred of the operations to the world's credit as of last May, the medical marvel of transplanting hearts is almost a mundane occurrence. In fact, heart-swap pioneer Dr. Christian Barnard forecasts that "... in a few years' time we shall have reached the jet age in transplant."

Here, certainly, is a Twentieth-Century technical "miracle" to rank with taming the atom and exploring the moon. Yet, for me, its thrill is tempered by a personal reservation. I wouldn't want to land in an accident ward where surgeons might look on me as a potential donor of vital organs. To judge from the outcry following a heart transplant at Guy's Hospital, London, others share my misgivings. In this case, the donor was pronounced dead while the heart was still beating. Relatives have only the doctors' word for it that the patient, an accident victim with heavy brain damage, would never have recovered.

The doctors worked in a twilight zone between bodily death and life. The heart was kept going with help of a breathing machine. It stopped when the machine stopped. Two doctors, independent of the transplant team, certified death due to irreversible brain damage. This satisfied requirements of British law.

A Swedish doctor, who performed a similar transplant in Switzerland, may be in a stickier legal position. Death under Swedish law involves heart stoppage. Organs may not be removed before that. And a Swede who breaks Swedish law in a foreign country can be prosecuted back home. Sweden's state prosecutor was asked by a citizen to look into the case.

But while the Guy's transplant was legal, news of it stirred a public storm still raging at this writing. Quite obviously, many people are uneasy about leaving it up to doctors to decide when to shut off life-sustaining machines and to consider a body so sustained as merely a source of fresh organs. Quintin Hogg, Shadow Home Secretary in the Tory Opposition, summed up this feeling by saying: "We have to protect the victim of an accident from being destroyed before he is irrevocably dead."

Definitions of Death

This lack of medically sound and legally and morally acceptable criteria for fixing the moment of death is one cause of the dilemma facing transplant surgeons. Old guidelines based on cessation of breathing and heartbeat won't do when these functions can be sustained artificially. Many medical authorities favor criteria based on irreversible brain damage that puts a patient into a permanent coma. They see no point in maintaining a body in a kind of vegetative life when others, who might recover, need the scarce and costly machines.

This begs the question of who is to decide when to pull the plug and on what to base the decision. A Harvard University panel, defining death in terms of the brain, drew up a definition of irreversible coma which included such points as: "Unreceptivity and unresponsivity—even the most intensely painful stimuli must evoke no vocal or other response. No movements or breathing for at least one hour. No reflexes. Flat electroencephalogram." A flat EEG would indicate no electrical activity in the brain. The panel urged the tests be repeated at least 24 hours later. Applying such criteria can be tricky. Probably most doctors know of cases where patients recovered from what, for a time, looked like irreversible coma.

Thus even determining death of the brain is often a matter of complex clinical judgment. Recognizing this, organized medicine has shied away from trying to have predetermined death criteria written into law even though some doctors would like to clarify the legal position. Medical bodies also recognize that transplant surgeons are too biased to judge the death of a donor themselves.

When the House of Delegates of the American Medical Association set transplant guidelines last December, it said: "The cause of death must be evident and be of an irreversible type. The fact of death must be established by adequate, current, and acceptable scientific evidence. The determination of death in organ donors must be made by no less than two physicians not associated with the surgical team performing the transplant."

And in Britain last year, a Minister's Conference on the Transplantation of Organs agreed "... that no attempt should be made to lay down a legal definition of death or rules which doctors should observe in reaching what must be a clinical decision. ... Vital organs should not be removed until spontaneous vital functions had ceased and two doctors, each independent of the transplantation team and one of them being at least five years qualified, had certified that this condition was irreversible."

Such guidelines read well. If it were merely a matter of deciding when to switch off body-sustaining machinery, most people would probably go along with them. But in transplants there's a sense of urgency, an eagerness to give someone a new lease on life, that many people apparently suspect could lead to medical murder.

Dr. Geoffrey Spencer, who heads the intensive care unit at London's St. Thomas's Hospital, has sensed this mood in the British public. He explained, "The only acceptable limited definition of death is that it is an irreversible cessation of spontaneous activity in all the tissues of the body. But there is no point in transplanting a dead organ. The point is that different parts of the body deteriorate and die at different rates. It is common for the brain to be damaged while other parts are going along quite well.

"The problem is created by the speed demanded by transplantation techniques involving liver and heart. A decision on these organs must be taken within 15 minutes in the case of the liver and 30 minutes with the heart, following cessation of oxygen supplies. This is why the general public are demanding rather more than the clinical judgment of experienced doctors who say, for example, 'This brain is hopelessly damaged.'"

The Donor's Permission

The other aspect of the transplanters' dilemma involves this same time pressure. How, with such a deadline, to get relatives' permission to remove organs if a potential donor has not done so legally before death? Dr. Spencer has said the time pressure can create an atmosphere

in which doctors seek relatives' consent under virtually "shotgun" conditions. At a time of great emotional stress, such relatives are pressed to O.K. the use of the body of someone they love as a supply of spare parts.

To a clinician, that may seem an extreme or maudlin way to put it. Transplant surgeons aren't being mean. In seeking the permission, they are thinking of living patients whose lives may be saved, or at least prolonged, by a timely organ transplant.

This, probably, is what Dr. Roy Calne, Cambridge University's liver transplant pioneer, had in mind in urging that everyone be considered a potential organ donor. As he expressed it in the *British Medical Journal*, "It would be a great help in the development of transplantation if permission was automatically assumed to have been given, unless active objection had been made." You could opt out of this in advance by registering in some kind of national roster of non-donors, perhaps a list monitored by computer. Not only would this help surgeons work more quickly, in Dr. Calne's opinion it would relieve relatives of a heavy burden. "... Seeking permission from the relatives who have suddenly been bereaved—particularly in the case of accidents—can cause a great deal of distress unnecessarily," he said.

From a surgeon's viewpoint, these may be reasonable sentiments. In the heat of discussion following the Guy's Hospital case, Dr. Calne's suggestion sounded ghoulis—"... precisely the sort of argument that ... will add fuel to the 'vultures' school of thought," chided the journal *New Scientist*, adding, "It is essential that organs are taken only on the basis of a positive decision, made by the donor in advance after serious consideration."

Here then are the outlines of the transplant dilemma. Doctors must often judge a donor's death under conditions and by criteria that seem fuzzy to laymen. A surgeon must press for permission to remove organs with a haste that appears ruthless. Yet if he hesitates on either account, he may miss his chance to help someone else. Somehow the doctors con-

cerned must keep faith with both the living and the dead in a situation that presents no leeway for miscalculation and few medical, moral, or legal precedents to guide them.

The Role of the Public

Medical experts need all the help they can have to resolve this dilemma. The issues go beyond their special competence. Some doctors seem to resent the publicity transplants are getting. They may feel this inaccurately represents them, distorting the issues and confusing the public. There has been a surfeit of sensationalism. Yet this is a point where the cutting edge of medical progress has touched raw nerves of public concern and private sensitivity. May not the editor of *Nature* be right in noting, "Surgeons may not relish the hot breath of the spectator... but it is the spectators, after all, who will eventually decide the rules of the game..."

Legislatures in Britain, Canada, South Africa, the United States, and maybe other countries are beginning to think about revising laws to cover transplants. Only with the help of informed public opinion, an opinion that has yet to crystalize, can sensible guidelines be laid down.

This challenges all of us to rethink our concepts of man and life. We can't treat individual men and women like old automobiles whose chief value at some point is as a reserve of parts to keep other cars going. We need to fit transplant surgery into a moral and legal framework that will both enhance the integrity of the individual and enlarge his opportunity for a healthier life.

Today such surgery is still an uncertain experiment. Recipients of new hearts have a short life-expectancy. Yet surgeons see bright promise. They take courage from the example of Dr. Barnard's first transplant patient, Dr. Philip Bläberg, still alive at this writing 18 months after the operation. He has had setbacks in that time. But he has also felt well enough to write a book entitled *Looking at My Heart*. It's a feat to match looking back at our planet from the moon.

Robert C. Cowen, who studied meteorology at M.I.T., is Science Editor of the *Christian Science Monitor*; he is a Past President of the National Association of Science Writers.

Science: The Frontier Still Is Endless

American liberals have a strong concern with individual welfare, hoping that every person in the nation will rise to a high standard of achievement and happiness. But allied with this hope is a strain of pessimism which could prove dangerous for American science. Among liberals, there is a tendency to be bored by—to underestimate—the continuing growth of material prosperity in this country. Without this growth, which is based upon increasing productivity conferred by technology and ultimately by scientific discoveries, the price of the individual justice sought by liberals cannot be paid without revolution.

Despite this, liberals tend to argue that there is too much emphasis on private wealth-getting, too little emphasis on public enterprise that would bring amenity, even nobility, to our society. There is a liberal tendency to be concerned about planning and control, to be more concerned about the distribution of wealth and less about increasing the total of the wealth to be shared.

One of the most important expressions of this line of thought is Franklin Roosevelt's address at the Commonwealth Club of San Francisco on September 23, 1932, which was drafted by Adolph A. Berle and which suggested that America would now have to administer itself within closed frontiers.

"So manifest were the advantages of the machine age" in the Nineteenth Century, Roosevelt said, "the United States fearlessly, cheerfully, and I think rightly accepted the bitter with the sweet. It was thought that no price was too high to pay for the advantages which we could draw from a finished industrial system. . . . It has been estimated that the American investor paid for the American railway system more than three times over (while they were being built), but despite this fact the net advantage was to the United States. . . .

"During this period of expansion there was equal opportunity for all, and the business of government was not to interfere but to assist in the development of industry. . . .

"In retrospect we can now see that the turn of the tide came with the turn of the century. We were reaching our last frontier. There was no more free land and our industrial combinations had become great uncontrolled and irresponsible units of power within the state. . . .

"Equality of opportunity as we have known it no longer exists. Our industrial plant is built. The problem just now is whether, under existing conditions, it is not overbuilt. Our last frontier has long since been reached, and there is practically no more free land. More than half of our people do not live on the farms or on lands and cannot derive a living by cultivating their own property. . . .

"The day of the great promoter or the financial titan, to whom we granted anything if only he would build or develop, is over. Our task now is not discovery or exploitation of natural resources or necessarily producing more goods. It is the soberer, less dramatic business of administering resources and plants already in hand, of seeking to re-establish foreign markets for our surplus production, of meeting the problem of under-consumption, of distributing wealth and products more equitably, of adapting existing economic organizations to the service of the people."

It is ironic, in view of the deeply felt liberalism of this speech, that one of Roosevelt's last acts as President was to ask Vannevar Bush, his wartime science adviser, to draft a report appearing as *Science, The Endless Frontier*, on the support of American science after the war.

The report began:

"Progress in the war against disease depends upon a flow of new scientific knowledge. New products, new industries and more jobs require continuous additions to knowledge of the laws of nature, and application of that knowledge to practical purposes. Similarly, our defense against aggression demands new knowledge so that we can develop new and improved weapons.

This essential new knowledge can be obtained only through basic scientific research. . . .

"One of our hopes is that after the war there will be full employment. To reach that goal the full creative and productive energies of the American people must be released. To create more jobs we must make new and better and cheaper products. We want plenty of new, vigorous enterprises.

"But new products and processes are not born full-grown. They are founded on new principles and new conceptions which in turn result from basic scientific research. Basic scientific research is scientific capital."

The contrast between the pessimism of 1932, where America's leading liberal politician thought he confronted a closed frontier, and 1945, when science was seen as the means for perpetually opening new frontiers, is striking.

Science Taken as a Fact of Nature

The vision of 1945 has had more than two decades to prove itself. Real wealth per person in the United States has more than doubled. This advance in wealth is the only basis on which programs to assist the disadvantaged can be continually enlarged. Economic growth is the only means for helping people who cannot keep up with the conditions of that growth, or who have been actively prevented from keeping up.

But it seems that many critics of American society, who want it to do more to live up to its principles, have forgotten this.

Because of the Vietnam war and the welter of hatreds and hopes unleashed by the great social legislation of the 1960's—and not least because the United States is prosperous enough to send an absolutely unprecedented proportion of its young people through college—America seems to be going through almost as sharp a self-questioning as it experienced during the depression, another period when the ability of the successful and established people to handle things was deeply doubted.

The central argument is that the rate of fulfillment of American promises is too slow. Implicit in that argument is the idea that American prosperity, produced by science and technology and the will of entrepreneurs determined to apply new knowledge, is so great that the excuses for social injustice have disappeared. In more practical terms, the idea is that the American economy, which seems to have less and less use for the poor and unskilled, is rich enough to pay for raising the poor and unskilled out of that state.

To most of the critics, of course, science and technology are either irrelevant or allied with evil. Because we live in an age of science, the influence of science so permeates our society that it is taken for granted, like a fact of nature. Except, of course, where science is seen to buttress a supposedly evil power-structure. The critics make a connection between the flow of scientific discoveries and an unceasing demand by the military for new weapons systems threatening to unbalance the balance of terror between the United States and the Soviet Union. A connection is made between science-fed industrial growth and the pollution of air and water by chemicals and heat and the by-products of combustion.

It is forgotten that only by continuing military research can there be enough assurance to allow a vigorous disarmament policy. The more than 20 years of effort by scientists to limit arms and increase international cooperation are ignored. It is forgotten that research and development are the only pathway toward means of pollution-control that are not ruinously expensive.

The really important point, however, is that a redistribution of wealth, or of self-esteem, cannot occur without bloodshed unless there is an increase in total real wealth. In crude terms, there must be a payoff for everyone or we have civil war. We have had two civil wars in our history—one during our struggle for independence and the other in the 1860's and the effects are still with us. There is no need or excuse for a third, but the violent language of left and right these days would appear to call for one.

If there are going to be guaranteed annual incomes for really poor people, a policy of reducing segregation by race and income, or expensive programs of special education for the unskilled, then there will have to be higher wages for the taxi-driver who sees little social distance between himself and the welfare recipient.

It is important to realize how much benefit is in store for those who agitate most for aid to the poor. Much of this agitation comes from guilt-ridden persons whose incomes are well above the median and who can expect that they, or their highly educated children, will gain much of the personal satisfaction,

challenge and extra income from administering the new programs, or from selling goods to people who have become better able to pay. Charity earns dividends.

Must the Vigor of Science Be Dissipated?

During several years of complaint, disillusionment and anger bordering on the self-destructive, U.S. government spending for science has remained on a plateau, abandoning the boom-time increases of 15 per cent a year that followed the shock of Sputnik I. During this time, of course, the flow of scientific discoveries has not stopped, and there have been large increases in the number of science graduate students (the overall total is much more than double that of 1960). But commitments to large new instruments, without which discoveries at the frontiers of science cannot be made, have been held up; and scientists are worried that if they must remain much longer on the plateau, the vigor of their enterprise will wane—and along with it the real growth of the American economy.

The worry has become so great that ideas for a cabinet-level department of science, usually discarded in the past because it was thought that more support for science would be generated by competition among federal agencies, have been revived.

Jerome B. Wiesner, Provost of the Massachusetts Institute of Technology and a former presidential science adviser, is one of those who finds his mind changing on the issue of a department of science. In a talk at the dedication of a chemical company's technical information center, published in this magazine early this year (see *"Rethinking Our Scientific Objectives"* in *Technology Review* for January, 1969, pp 14-17), Dr. Wiesner said:

"Given the present antagonisms and the considerable skepticism about the value of continued high-level research and development activities, I have concluded that the only solution is to reorganize and strengthen the federal mechanisms for planning and supporting research and development. . . .

"In the past, those of us who have studied the problems of science policy generally concluded that the more diffuse multi-agency arrangements currently employed served the nation better than would a single department of science, into which were consolidated all federal research and development activities.

"I still feel that a single agency with the responsibility for all federal activities would be a poor arrangement. In fact, I believe it would be a mistake even to concentrate the responsibility for all basic research into a single agency.

"But given the present situation—one which I am certain will persist unless another major military confrontation

develops—we must create more effective mechanisms for planning and managing the government's scientific activities."

The idea that U.S. scientific research will have difficulty growing without some new military crisis represents profound discouragement, which is widely shared among scientists.

Ironically enough, statements like Dr. Wiesner's are heard at a time when members of Congress and the scientific community are searching for ways to reduce the dependence of research on support from defense agencies and direct the skills of scientists and engineers more consciously toward civilian goals.

A Quintessentially American Activity

If the U.S. government really means to use its resources for more civilian ends, then its support of scientific research must become perhaps even more vigorous than it was when its commitment to science was spurred by motives of national defense and national prestige.

Liberal leaders, such as Representative Emilio Q. Daddario of the House science committee, who delayed the resurfacing of the 1000-foot radio telescope at Arecibo, Puerto Rico, last spring because of misplaced anger at Department of Defense "dumping" of research projects, must face this.

It is to be hoped that both liberal and conservative leaders will approach the problem of finding enough money to support American science vigorously with the idea that scientific discovery is one of the glories of Twentieth Century America—a quintessentially American activity which reinforces intellectual liberty while helping to create the wealth to sustain it.

Science not only opens new material frontiers which make the closing of the territorial frontier irrelevant, it also opens new mental territories where the imagination may run beyond the reach of authority.

Victor K. McElheny, Science Editor of the Boston Globe, is a distinguished science writer; he has been European correspondent of Science magazine and is a former Nieman Fellow at Harvard University.

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Even in the Cannon's Mouth

In Touch

John Steinbeck IV
New York: Knopf, 202 pp., \$4.95

One Man's Initiation: 1917

John Dos Passos
Ithaca: Cornell University Press, 179 pp., \$5.95

There is a sense in which the contemporary problems of war and peace, inflation, riots in the cities, poverty, and social injustice are self-defining. We may find little enough agreement as to causes and cures, but we know, if only in a general way, what the problems are about.

This is more than we know about "the problem of today's youth." The realms in which it exists have flexible boundaries, sometimes shrinking to pinpoints of psychology or economics, sometimes expanding to include all human culture, past and present. Furthermore, it appears to be extraordinarily difficult to explain or even describe the turbulent disharmony between many young people and the institutions of society without stumbling over untidy piles of clichés: generation gap, failure of communication, alienation, existential moment, search for meaning, for relevance, for identity . . . ; the list grows longer and more solemn with each new attempt at understanding. Perhaps it is inevitable, since whatever is said must start from the biological stereotype that children have parents, and vice versa. An Oscar Wilde is needed to turn clichés into epigrams. "Children begin by loving their parents; after a while they judge them; rarely, if ever, do they forgive them."

If, as seems likely, clichés tend to cluster around large generalizations, it may be enlightening to consider not *youth*, but two specific, individual young men, each of whom has written about himself.

Saigon, 1966

John Steinbeck IV, son of the novelist, arrived in Saigon in June, 1966, on his twentieth birthday, fresh from basic training. Assigned to write broadcasts for Armed Services Radio and Television, he traveled throughout Vietnam, with Saigon as his base, spending his non-working hours in what he considered to be "educational debauchery." Liquor, marijuana,

and girls were plentiful and cheap. G.I.'s were supposed to sleep in the hotel rooms allocated to them, but since there was no bed check it was simple to make other arrangements. For a while, Steinbeck lived in a brothel where he found, to his surprise, that the family atmosphere encouraged a brother-sister relationship between him and the 12 girls.

After a year in Vietnam, he managed to have himself placed in the Army Office of Information in Washington to complete his military service. A casual, almost accidental, involvement with a group of hippies led to his arrest, when a suitcase containing 20 pounds of marijuana, which they had stored temporarily in his apartment, was found by the police.

His trial and acquittal, followed by the publication of his article on the use of drugs by soldiers, "The Importance of Being Stoned in Vietnam," made him a spokesman for marijuana on television programs and a witness, as an expert, before the Senate Subcommittee on Juvenile Delinquency.

Then he wrote his book which, he says, "might well be subtitled *A Year in the Life of One Young American*."

Verdun, 1917

John Dos Passos went to another, earlier war. He landed in France in the summer of 1917, 21 years old, to serve as driver and stretcher bearer with a volunteer ambulance service stationed behind Verdun. The great battle for the city was over, but there was still fighting and there were still casualties to be transported in wild, nightmarish rides from the front to field hospitals, through bombed villages and field of shell holes. Occasionally the unit was withdrawn to rest in a small town farther back, and once there was a leave in Paris, where there were girls, good wines, and bathtubs with hot water.

When the volunteers were disbanded, Dos Passos went to Northern Italy with the American Red Cross. As his term of enlistment came to an end, he was in trouble with the Italian censors and the Red Cross for his incautious letters to friends. He sailed home on a first class ticket: "When you are in wrong with the authorities always travel first class."

He started his book on the homeward-bound steamer, finished it in New York, then sailed out again as an ambulance driver in the United States Army Medical Corps. Presumably he carried the manuscript in his musette bag, since he found a publisher in England after the Armistice. The book has been re-issued with a long introduction by Dos Passos, written 50 years later.

One Man's Initiation: 1917, which deals only with his experiences in France, is a novel. It is a creditable first novel in which it is possible to see the initial stages of the creation of the literary style and identity that made Dos Passos a major writer of the decades between the wars. Like the early work of many young men, it is autobiographical. In fact, the new introduction by Dos Passos contains copious extracts from letters and diaries, which we can often find incorporated word-for-word in the book, so that we may properly look upon it as a documentary, rather than a fictional, narrative.

The Parallels

It is in this sense, of course, that the juxtaposition with *In Touch* is relevant. Separated by half a century, John Dos Passos and John Steinbeck IV appear to speak in unison. "... We were full of curiosity about the world at war," wrote Dos Passos. "We wanted to see with our own eyes. ... I respected the conscientious objectors, and occasionally felt I should take that course myself, but hell, I wanted to see the show."

"I was not quite ready to enlist . . .," wrote Steinbeck. "But if I were called I knew that I would go. If this was the war for my generation I would accept it, let it happen to me, and also satisfy my curiosity about Vietnam and myself."

Both went to war at an early age, both served as noncombatants, both were in trouble with the authorities. They were disgusted with their own times, and convinced of the virtue of the young and the iniquity of their elders.

"... All young men are frightfully decent. If we only governed the world instead of the swagbellied old fogies in frockcoats that do. Oh, what a god-damned mess they've made of organized

society, the bankers and brokers and meatpackers and businessmen! . . . Down with the middleaged . . ." (Dos Passos).

In this area, Steinbeck has a small problem. It is not easy for a young man whose father is a Nobel Laureate in literature to see him as one of the swagbellied old fogies. But he can be faintly derogatory by condescension: "Lettvin (Professor Jerome Lettvin, M.I.T.) is one of the enlightened older generation. . . ."

And both turned against the wars in which they had enlisted. ". . . It was clear to every man of independent mind that the war was a senseless bloody massacre which served no purpose but to destroy the delicate fabric of civilization" (Dos Passos). "After I had been in Vietnam for a while I . . . could not continue to feel that it was my generation's war. . . . We became disenchanted with our mindless patriotism . . ." (Steinbeck).

Are we discovering the obvious by demonstrating that human nature does not change, after all? Perhaps. But it is necessary to know *how* the ways of thinking, feeling, acting of two young men 50 years apart are similar. Then we may look for illuminating differences.

The Changes

Some are small differences. Marijuana serves the same purpose for Steinbeck that wine serves for Dos Passos. Books are hardly mentioned by Steinbeck, while Dos Passos reads almost anywhere—on a

cot in his ambulance, in a dugout, a village inn—such books as *The Duchess of Malfi*, Rousseau's *Confessions*, Rimbaud's poetry.

Dos Passos was a socialist when he volunteered. He was against war, against capitalist exploitation of workers; he planned to "fight with pen and tooth and nail for free speech and general liberty." Steinbeck's public positions are "existential," he might say, arising in response to specific situations. His trouble with the authorities came out of his involvement with hippies and drugs, while Dos Passos' trouble was political.

It is true that Dos Passos was closer to the pain and suffering of soldiers in battle, which he describes with horror, pity, and anger. In the course of a year in Vietnam, Steinbeck must surely have seen fighting or the aftermath of fighting, bombing or its consequences, but there is not a drop of blood on any page of his book—except in the account of his fight with a gang of Vietnamese hoods who attacked him in the house of a prostitute.

At 21, Dos Passos knew that he wanted to be—that he would be—a writer. At 21, Steinbeck has not yet decided about his future.

Steinbeck is cool, Dos Passos is passionate.

Finally there is the difference whose meaning is epitomized in the closing, the

last page, of each book.

Martin, the protagonist of *One Man's Initiation: 1917*, kneels beside a wounded soldier on a stretcher.

"Is there anything I can get you?" asks Martin softly.

'Nothing.' Slowly the blue eyelids uncover hazel eyes that burn feverishly. 'But you haven't told me yet, how's Merrier?'

'A shell . . . dead . . . poor chap.'

'And the anarchist, Lully?'

'Dead.'

'And Dubois?'

'Why ask?' came the faint rustling voice peevishly. 'Everybody's dead. You're dead, aren't you?'

'No, I'm alive, and you. A little courage . . . We must be cheerful.'

'It's not for long. Tomorrow, the next day . . .'

The blue eyelids slip back over the crazy burning eyes and the face takes on again the waxen look of death."

Steinbeck and a friend, driving across the country, decide to visit an old girl friend in a small town near Los Alamos. She takes them up into the mountains, where a warm spring has eroded a rock to form a giant bowl.

". . . Without our willing it we knew in the softest *déjà vu* that we belonged here; we'd always been around. There was no sign whatever of any other human being. It was early evening and a light snow was falling. We stripped and the three of us jumped into the warm bath, splashing and frisking like seals. As darkness came on we lolled in the warm pool, feeling deliciously the primeval organisms which we were, at play in our natural environment. We were perfectly at home with our world around us, as a Hindu saying puts it, like notes on one flute. It wasn't to be known where the instrument stopped and the song began. Mysteriously the music would always continue. The snow kept falling, dropping straight down, closing in all around us like a sheltering curtain, melting the instant it hit the warm water."

New from the M.I.T. Community

Molecular Biology—A Structural Approach, Christopher U. M. Smith. Cambridge: The M.I.T. Press, \$12.50. A general summary of knowledge in molecular biology intended for the scientifically oriented general reader as well as for high school students and college freshmen planning to study one of the biological sciences.

Joseph Mindel is a member of the M.I.T. Lincoln Laboratory. The note "New from the M.I.T. Community" has been prepared by the Editors of Technology Review.

The MIT Press has launched a new series of books in the rapidly emerging area of ocean engineering. Supported in part by the National Science Foundation's Sea Grant Program, the mission of the series is to provide a basic coverage of the subject, encompassing both the undergraduate and graduate curricula.

Preliminary text editions of the first four titles in the series will be available in August (prices tentative). Their authors are all members of MIT's Department of Naval Architecture and Marine Engineering.

Public Policy and the Use of the Seas

by Norman J. Padelford 361 pp. \$5.00

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Water, Air, and Interface Vehicles

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by J. Harvey Evans and John C. Adamchak 303 pp. \$5.95

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To the Unconverted

Technology Unbound

Steven R. Rivkin

New York: Pergamon, 116 pp., \$4.95

Factors in the Transfer of Technology

Ed. by William H. Gruber and Donald G. Marquis

Cambridge: M.I.T. Press, 300 pp., \$12.50

It is becoming almost ritualistic to say that we have devoted major efforts to the problems of defense, while neglecting the problems of that which is being defended; that we are giving serious attention to the exploration of other worlds, while all is still far from well on our own. Now, assuming that we would like to respond to this criticism, what exactly can be done?

Technology Unbound is an attempt to answer this question, and it comes with an imprimatur from the Assistant Director of the U.S. Arms Control and Disarmament Agency. *Factors in the Transfer of Technology* is wider in scope, dealing quite generally with the way expertise passes (or fails to) from one application to another. The first is a single long essay, replete with statistics, on the kinds of industry that cater to the Department of Defense, N.A.S.A., and the Atomic Energy Commission; the losses they would suffer from various degrees of defense restraint or disarmament; and their possibilities for adaptation to civil tasks. The second is a collection of papers, originally presented at the 1966 M.I.T. Conference on Human Factors in the Transfer of Technology.

Mr. Rivkin tells the story of the growth of the defense industry since the Second World War, and describes the nature of the dependence (not simply economic) of many companies, large and small, on the three defense-related agencies. He examines three possible "strategies for survival" of such companies, namely: "Diversify within the Defense/N.A.S.A. complex . . . ; seek problem areas, in fields other than aerospace, which appear particularly appropriate for the application of the industry's massive technical resources; diversify into industrial or consumer products." (The quotations are from an A.D. Little study.) He discusses the strains that such strategies would impose on the companies, on their employees and on

the communities that have grown up around many of the new industries.

In this section Mr. Rivkin cites a report by the Denver Research Institute, to the effect that the time to get into civilian activities is just *before* a "defense boom" (make hay and other useful things while the sun shines).

He then reviews the non-military work to which the defense firms could possibly address themselves, and devotes a short final chapter to "the prospects for adjustment." This last section is depressing. "As increasing emphasis is given to R and D in support of national needs . . . attention will have to be given to strengthening the largely undeveloped capabilities of governments, as well as private institutions, to engage in a productive dialogue. For the diffused and fragmented domestic fields which this report has suggested for increased emphasis, that dialogue is in many ways even less advanced than was the sorry state of the nation's readiness for the Space Age a decade ago." This comparison, coming at the end of a book which details the reasons why a major segment of industry can do nothing much except what it was developed to do, leaves us with a vision not of *Technology Unbound* but of our old benefactor still firmly shackled to that rock, morally disemboweled on every campus but immortal nevertheless.

So much for the difficulty of teaching old dogs new tricks. What we must not forget is that younger dogs are being littered all the time, and they quickly learn whatever tricks are rewarded. ". . . we found that 39 companies had been started by 44 former employees of one large Greater Boston electronics company. The 32 present corporate survivors of this group had sales in 1966 . . . estimated as approximately double the sales volume of the 'parent' company. . . ." This finding is cited by M.I.T.'s Professor Edward B. Roberts in *Factors in the Transfer of Technology*. Professor Roberts reports also on a study of over 200 companies founded by ex-employees of M.I.T. laboratories and other sophisticated establishments. "It is characteristic of the advanced technology markets served by the spin-off companies studied that the federal government's role as a customer

provides the catalyst needed. . . . Yet once moving with the stimulus of the initial government market the new technologically based company seems able to penetrate new areas of application."

This is one of a number of clues to be found in the Gruber and Marquis volume. The original conference papers have not only been modified by the authors (a rare enough outcome for any conference) but have been drawn together in a new introductory paper by Professor Tom Burns of the University of Edinburgh's sociology department. Professor Burns writes that underlying the meeting was the awareness that technology is transferred from one application to another not by the transmission of technical information but by the physical movement of people. While obvious enough after a moment's reflection, this truth is so generally ignored, and on so massive a scale, that it has the force of a revelation. "Major projects have been instituted for mechanically recording and retrieving the great mass of technical information concerned with the solution of technical problems and with the development of new processes and products which the space program has generated." (One such abortive effort is described, under the title "The N.A.S.A. Experience", in *Factors in the Transfer of Technology*.) Whereas, the really profitable use of specialized knowledge clearly begins with the hiring of the specialists.

Nevertheless, Gruber and Marquis in their concluding summary can write that "an understanding of the human factor in the transfer of technology, based upon rigorous scientific investigation, represents a gap in the state of managerial technology."

The scientific-technological establishment can be viewed either as a collection of organizations possessing the ability to produce certain kinds of equipment and systems; or as a network of fields of specialized knowledge; or as a school in which people acquire this knowledge and then look for psychologically and financially rewarding ways of using it. The difficulties of altering the national sword/plowshare ratio appear greater or less depending on which picture is kept uppermost.

British Scientists: Other Side of The Coin

I have never been to the States. Like the vast majority of British scientists I am content to live and work in England. Yet this attitude frequently causes raised eyebrows among my non-science colleagues, many of whom seem to take it for granted that British scientists, *en masse*, are setting their sights on the U.S.A. So much publicity has been given to the "brain drain" that the public seems to assume that any self-respecting scientist in England is secretly engaged in private plans to uproot himself and head out, across the herring pond, to the bright academic lights of affluent, exuberant America.

Of course, it is not like that. Three or four thousand scientists emigrate from England every year, but the bulk are going to stay and work in an environment which, if a little shabby here and there and somewhat tattered around the political edges just now, is nonetheless the most civilized and balanced in the world. The public concept of a lemming-like instinct to flee has no roots in reality.

But the public attitude to the conditions of employment of British scientists is equally wide of the mark. It is widely felt that science is one of the glossiest professions and certainly a very worthwhile and promising career (albeit far better paid overseas). The newspapers are always emphasizing the need for more scientists, and, surely, thinks the public, the scientists have the power—so they must earn the money. In recent months I have tried to find some information about the lower regions of the spectrum.

The conclusions are a little disturbing.

For instance, although the more highly qualified and distinguished graduate admittedly earns a quite high salary in England (say, £3000 or more on the average) the "ordinary" graduate is far less well off. To an extent this is of course entirely predictable, but we were disturbed to find whole categories where the mean income never reaches £2000 per annum during the entire course of a career.

The Upper Crust Leaves . . .

A sample of these lower-salary cross-sections was obtained by analyzing the figures derived by professional institutes

and learned societies in Britain. They offer different grades of membership, of which "fellowship" is the highest as a rule and denotes a considerable degree of seniority, and "graduateship" (or whatever) is awarded to basic graduates. Senior members of the Royal Institute of Chemistry claim median salaries of £3170 at age 51-55. But ordinary or junior members—i.e. chemistry graduates with considerable post-graduate experience, but usually without distinguished lists of publications or subsequent higher degrees—average only £1940 at the same age. Similarly, metallurgists reach the £3000 level if they come from this "upper crust"—but a mere £1970 if only B.Sc.'s.

As salaries for graduates in science, these are poor even by English standards. They are certainly far lower than most people here had realized.

Yet one must emphasize at once that finance is not the main reason given by those scientists who have "brain-drained" to the States. A thorough and well-argued volume entitled *Graduate Study And After* by Ernest Rudd and Stephen Hatch, two leading English sociologists, showed (in 1968) that 39 per cent of emigrant scientists gave "desire to travel" as their reason for going; 26 per cent went to gain scientific or academic experience; 23 per cent went for better opportunities (but not financial rewards as such) and 22 per cent gave financial incentives as among their motives. So although the question of remuneration in England is important, it is not overriding. Most scientists clearly seem to want to see more of the world, and in this respect it is interesting to note that the U.S.A. and Canada take more British scientists than all other countries put together—but well over half of those who go seem to return.

. . . But the Cream Returns

It is interesting to observe the quality of emigrant scientists from Britain. As Rudd and Hatch showed, the qualifications of those who go overseas tend to be higher than those who remain. But of these it is the more highly qualified who, in turn, eventually come back to settle in Britain.

However, the "brain drain" is only one of the results of low pay and not-too-

good conditions in science. As we have seen, most scientists who leave Britain do so because of reasons other than those of finance and these are only a small proportion of the total anyway. Probably the most interesting conclusion one can draw from low salaries is that there is not a great demand for the personnel in the first instance; salaries are equilibrated by supply and demand, and not by the whims of government legislation or policy.

The official reports in Britain on the subject of deployment and supply of scientific manpower are virtually unanimous in suggesting that we need more scientists here, and we need them fast. But I am inclined to disagree. Certainly we need here, as everywhere else, more science—that is, more objective intellect—if we are to continue to progress satisfactorily. But this comes by education of public attitudes and changes in the nature of industrial/technological policies. This re-orientation could in turn lead to a higher level of demand for scientists and this might be followed logically by an endogenous tendency for an increase of supply. As it is we find that the converse is true; too many scientists are being turned out, and many of them have difficulties in finding any suitable employment.

Tales of Woe

Recently an advertisement was placed in the London-based *New Scientist*, calling for "tales of woe" from misplaced graduates in the discipline. Eighty or so respondents entered into the game with enthusiasm.

Among scientists unable to find any work and at present on relief (either receiving unemployment pay or state security benefits) were many B.Sc.'s with special postgraduate qualifications. A chemistry honors graduate in this category has subsequent degrees in psychology and philosophy and knows French and Chinese; and a physics graduate with a subsequent M.Sc. in physics and a Ph.D. in nuclear science also returned after doing research in the States to find no job. Of the others in this group, many had applied for 20, 40, or even 60 posts—and one older scientist reckoned on having submitted over 300 applications to date with no result.

But the scientists in non-science jobs had the real surprises in store. One B.Sc., A.R.I.C., was working as a laboratory technician alongside unqualified 16-year-olds, a physiologist was working as a junior ward orderly in hospital and a chemistry graduate was a temporary clerk. An M.Sc. biochemist was working as a stamp-dealer's assistant and an honors mathematics graduate had a job as a toyshop rockinghorse manufacturer. Another honors scientist—this time in physics—had been a bread-van driver and a shop assistant, and an M.Sc. in geophysics was a car-wash attendant.

Similarly placed were the nuclear physicist working as a laborer at a British Railways depot in Kent and the B.Sc. (biology) carpet-fitter. Another graduate in zoology had been recommended by his University Appointments Officer to take up the manufacture of serpentine jewelry (his hobby as a student) as a profession!

These people, it is clear, are the exceptions rather than the rule. They are in no sense representative of the majority, and the superficial nature of our sample precludes the slightest statistical pretensions of the survey. Yet this of course does not in any sense invalidate it, for the intention was not much to prove a hypothesis as to demonstrate exceptions to an accepted viewpoint—which is a valuable, if unorthodox, scientific approach. At present it has become widely believed in Britain that:

1. Scientists as a whole are very well paid;
2. There is a great shortage of scientists and considerable difficulty in filling scientific posts; jobs are therefore easy to come by;
3. The man with a B.Sc. has a key that will open almost any door and his professional career is assured.

At least we have severely dented that preconception.

Rethink Phase

But why, then, is the position like this? As would be expected, there are many facets to the answer. First, there is the "qualification gap" which I have discussed before—there is a marked dichotomy of interests between the way in which we educate scientists and the manner in which we expect them to perform.

Second, it is now very clear that, largely as a result of this fundamental irrelevance of modern science training, the science graduate is not fitting into the available niches. So many industrialists have said to me that they have searched in vain for a scientist with something to offer; they find these graduates filled with ephemeral knowledge but bereft of inspirational creativity.

Third, there has not been the awakening which we might have expected in the minds of the employment sectors of industry, planning, and the legislature. Scientists tend too often to be objects of

suspicion and regarded as gratuitous—not without reason in all too many cases, as we have seen. At present there is a fundamental need in Britain for a subtle phase of rethinking in the technological and science-intensive branches of industry which are simply not geared to the task in hand.

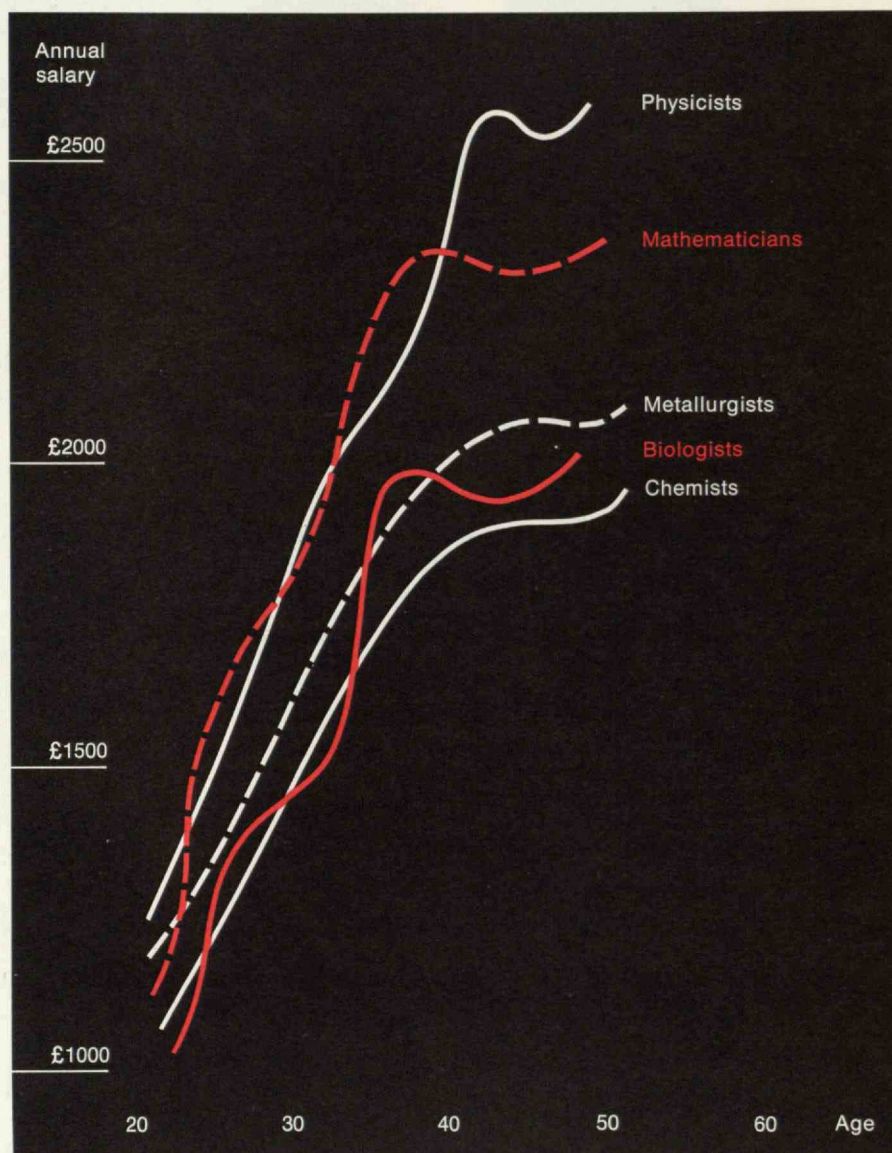
But the struggle for reform continues apace. Too many people in high places confide that there is a restlessness in science which ought not to be there.

In conclusion let us scan over the field. The majority of British scientists are more-or-less content with their posts and they receive, in many cases, very good salaries. But the picture is not as rosy and optimistic as it has been painted; large sectors of graduate scientists are not well paid, and there are indications that many scientists have difficulty in finding a suitable post, or a post at all

in many instances, in contradiction to official teaching. We are left with a suspicion that society has not been prepared here for the upsurge of scientific development that is now waiting in the wings, and that the scientists we are producing are not geared to the real needs of science.

Thus it is clear that there must be something of a reappraisal of science policy and just what it is going to aim at. And I dare say, naming no names, that Britain isn't alone in that respect.

Mr. Ford is an English editor, scientist, and lecturer who frequently comments on British scientific affairs.



Median salary levels for science graduates in Britain, against age and discipline. Figures apply to ordinary graduates only—those with a good pass first degree but without higher distinctions such as

doctorate or distinguished research publications. (From data supplied by the British Institutes of Physics, Mathematics, Metallurgy, Biology, and Chemistry. Officially £ 1 = \$2.40)

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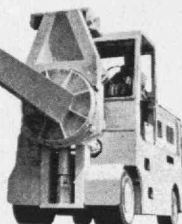
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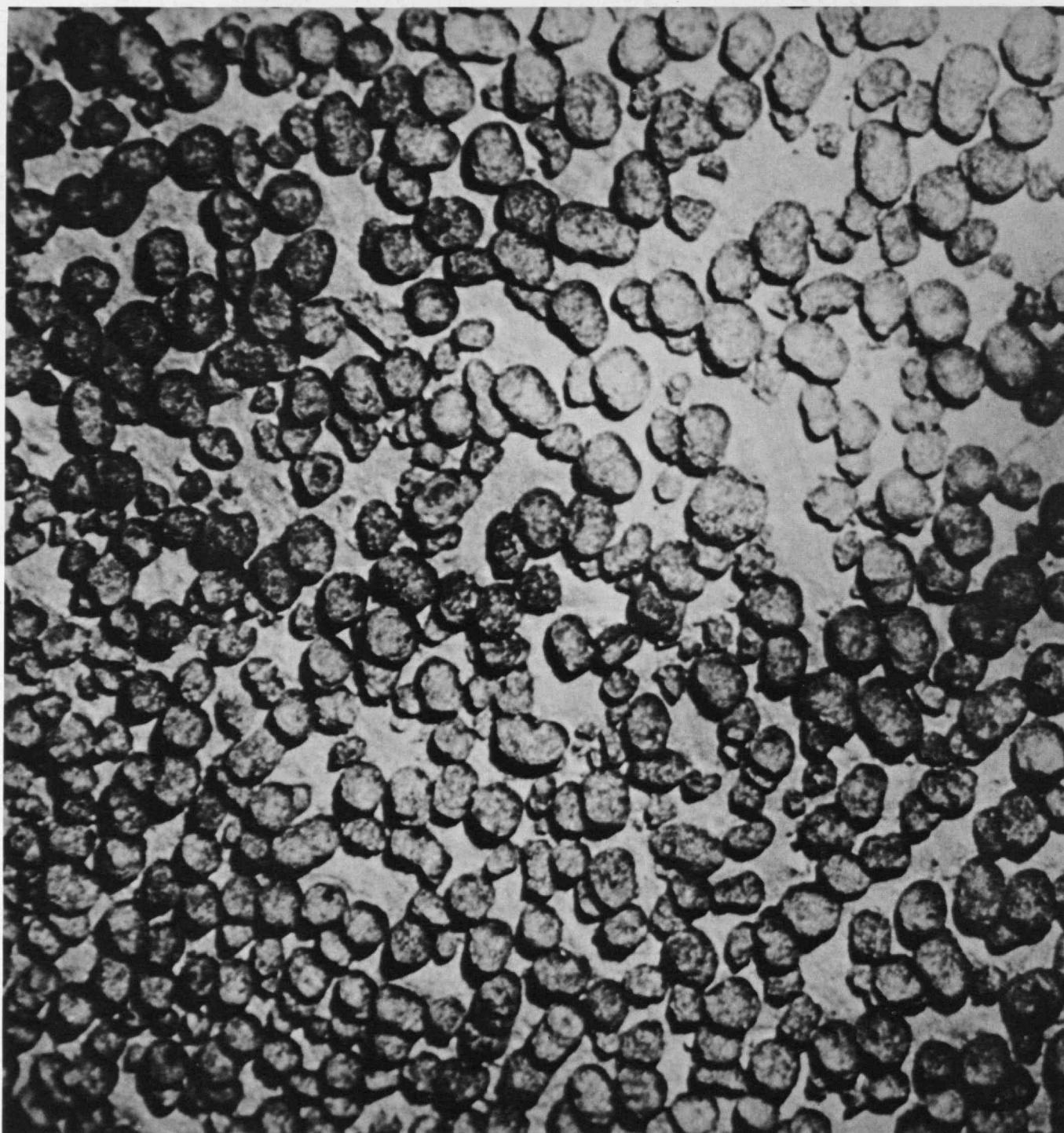
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Mineral nodules, 1 to 5 cm. across, photographed off Tierra del Fuego at a depth of 3860 meters. "The significance of ocean mineral resources," says Dr. Brooks, "is that they may represent a quantum increase in our stock of capital."



Offshore resources of minerals other than fuel are likely to be mined before the end of the century. The political, ecological, and economic implications are complex and contain many unknowns

David B. Brooks
Chief, Division of Mineral Economics,
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Ocean Mining: Political Opportunities and Economic Consequences

In a recent book Kenneth Boulding, President of the American Economic Association, referred to mining as an entropic process that transforms the potential energy of mineral resources into useful work. While the efficiency of this process is a tribute to man's ingenuity, Boulding pointed out that it inherently involves diffusion and depletion of the potential energy:

"We can therefore regard the present period as a unique opportunity in the history of this particular planet whereby the geological capital which has been accumulated over hundreds of millions of years in the form of ores and fuels can be spent to produce enough knowledge to enable man to do without the geological capital which he exhausts" (*The Meaning of the Twentieth Century* (New York: Harper & Row, 1964), pp. 141-43).

The significance of ocean mineral resources is that they may represent a quantum increase in our stock of capital. Geologically, the deposits certainly occur. But are they economic capital? That is the question. No one can answer categorically today, but at least the grounds for an answer can be clarified, and that is the purpose of this article.

In the first two sections, my remarks will focus on the non-fuel minerals. For one thing, demand forecasting for non-fuels differs from that for fuels in ways too complex to cover in a brief paper. More important, offshore fuels have already proven themselves to be economic capital. Incremental changes in drilling and production technology permitted the extension of petroleum exploitation from land to water and then into deeper water. But with few exceptions the technology both to explore for and recover hard minerals from the ocean will have to be substantially new. In the final section, where the emphasis shifts from economics to politics, both hard minerals and petroleum will be included.

I. The Economic Setting

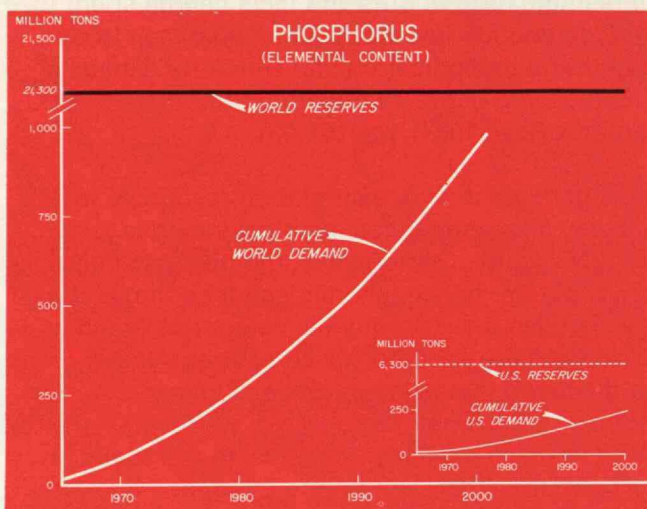
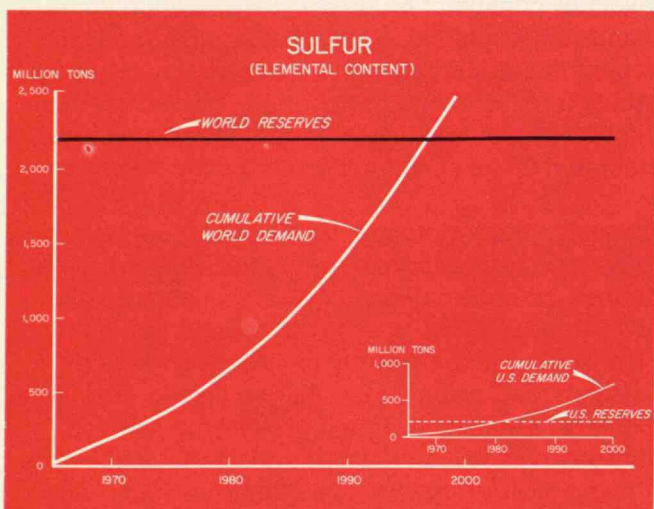
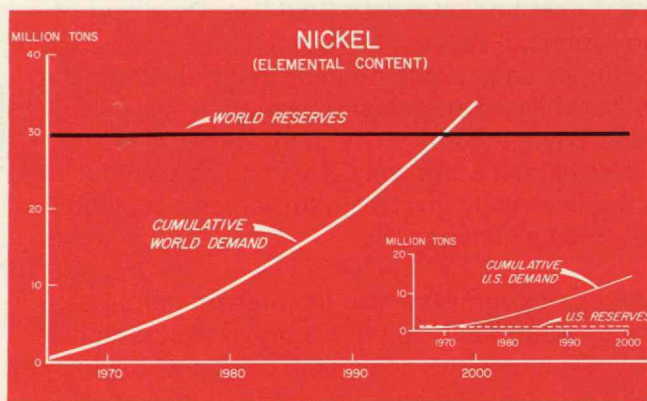
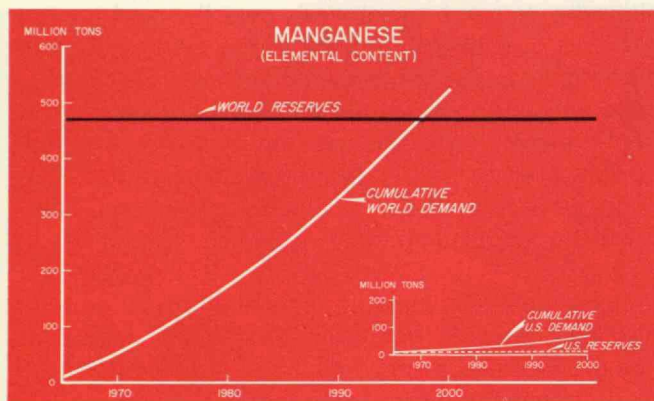
The first task in reviewing the economic setting for possible development of ocean resources is to con-

sider the demand for minerals over the next few decades—roughly to the end of the century. Before starting, however, let us be clear that projections yield only *apparent* resource demands. That is, they depend upon numerous assumptions, the most important of which is that there will be no radical changes in technology, tastes, or institutions. This is not a good assumption.

Think of what the demand for metals might be today had plastics not been developed. Moreover, any growth rate, even a small one, if projected far enough into the future, will eventually produce levels of consumption that impose ridiculous demands on resources. Nevertheless, it is useful to accept this assumption and then use the resulting projections as points of departure from which contingencies can be suggested that might shift consumption of the commodities under consideration.

To evaluate the potential supply situation, both U.S. and world reserves were estimated. Reserves are defined as known deposits economically recoverable at today's prices and with today's technology. This is a definition sharply limited by criteria of certainty and profitability. As geological knowledge expands, deposits will be discovered or proved, and reserves will increase. As technological ability grows, lower grade or more remote deposits will also become reserves. Thus, resources likely to become available contain much more material than reserves. And for most commodities, it is the perspective of resources, rather than reserves, that is needed to evaluate the oceans as an alternative source of supply.

Manganese—The graph (*next page*) shows that known world reserves of manganese are sufficient to meet cumulative world demand until the late 1990's. Since the primary use of manganese is in the production of steel, the contingency of rapid industrialization of the less developed nations could pull the date forward to perhaps 1990. But extensive low-grade onshore deposits of manganese are known, and they are capable of satisfying increased



Known reserves of manganese, nickel, sulfur, and phosphorus, and the foreseeable cumulative demands for these elements in the world as a whole and in the U.S. The term "reserves" means deposits economically recoverable at today's prices and with today's technology; total deposits can be considerably greater.

demand at prices no more than twice present prices, even in the unlikely circumstance that present technology must be used 20 years from now.

The situation is quite different within the United States, where the quantity of manganese ore mineable at present prices is negligible. Because of its strategic importance, a great deal of attention has been directed to the attempt to satisfy at least part of the domestic demand from domestic sources, but with little apparent success. The United States still imports essentially all of its manganese requirements, so that about one-third of the present price represents transport cost.

Recently, deep-sea manganese nodules have begun to attract attention as a possible new source of supply. These earthy ellipsoids, commonly an inch to several inches in length, occur over vast areas of the ocean bottom under 1,000 or more feet of water. They typically contain 20 to 40 percent manganese and up to 2 per cent each of cobalt, nickel, and copper. Unfortunately, the richest nodules tend to occur in deep water—say, 15,000 feet. (For a thorough discussion of the geology of the nodules and of potential mining techniques, see John Mero, *The Mineral Resources of the Sea* (New York: Elsevier, 1965), pp. 127-72).

It is of course their metallic content that has attracted commercial and governmental interest to the manganese nodules. To the extent that this interest stems from hope of curing the strategic problem, it is probably misplaced (*see below*), and to the extent that it stems from fears of some future shortage, it is certainly misplaced. But as a source that might be producible in competition with existing sources at some advantage in transportation cost, the nodules deserve attention (David B. Brooks, *Low-grade and Nonconventional Sources of Manganese* (Washington, D.C.: Resources for the Future, Inc., 1966), pp. 120-23).

Nickel—The resource situation for nickel is similar to that for manganese. As shown in the graph, world reserves can satisfy projected cumulative demand through the late 1990's. Since the main uses for nickel involve nonferrous alloys and special steels, even rapid industrialization would not cause cumulative demand to change very much. And while U.S. reserves of nickel are low, in this case there isn't even a strategic problem as our main sources of supply are in Canada.

Of course, nickel reserves do not complete the picture of onshore nickel resources. Lower grade sulfide ores and the very extensive but difficult-to-treat laterite ores are also available, at perhaps twice present prices, and it is with such material that deep sea sources would most likely have to

compete. So-called manganese nodules are a potential offshore source of nickel as well as manganese; it is commonplace now to remark that they may be more valuable for their nickel content than for their manganese. Indeed, whereas the manganese content of most nodules is below that of the better onshore sources, their nickel content commonly exceeds ores currently being mined. Thus, just as with manganese, it is for essentially commercial reasons that the nodules are being considered as potential nickel ores.

Sulfur—As the graph shows, reserves of sulfur from present sources appear inadequate to meet projected world demand beyond the mid-1990's—and within the U.S. beyond about 1980. Since most sulfur is made into sulfuric acid, about half of which is used to make fertilizers, any force that led to more intensive use of agricultural land would reduce the life of these reserves still further.

But in accord with the pattern that mineral economists increasingly recognize as typical, there are known and extensive resources that require only slightly higher prices or more advanced technology to become profitable sources of supply. In the United States, for example, approximately 7 billion tons of sulfur are contained in coal reserves. With the advent of air pollution regulations limiting the sulfur content of fuels burned to generate electricity, it is reasonable to expect that some of this sulfur will be recovered. In addition, there is an almost inexhaustible quantity of sulfur in gypsum, which is at present near economic exploitability.

Despite these alternative sources, and others, the outlook for marine sulfur is promising. Offshore sulfur deposits are identical to onshore deposits. Native sulfur occurs as a cap on salt domes that intrude into sedimentary rocks along the Gulf Coast. It is recovered by the Frasch Process, in which hot water is forced down one pipe, melts the sulfur, and carries it up another pipe. Two salt domes offshore in the Gulf are already being exploited, and a second lease sale of sulfur rights on continental shelf lands is being considered despite the fact that results from the first sale (held in 1965) have been disappointing. (By no means all salt domes carry sulfur.) Of course, in contrast to other hard minerals—which is really a misnomer when applied to Frasch sulfur—onshore technology needed only relatively minor adaptations to permit offshore extraction, quite a different situation from that for deep-sea nodules.

Phosphorus—The graph shows that reserves of phosphorus, both in the United States and in the rest of the world, far exceed the anticipated cumulative demand under any foreseeable contingency. Phosphorus is used primarily in fertilizers but even

the rapid growth of intensive agriculture would not deplete the reserves. However, onshore mining requires large land areas and involves several tough pollution problems. Increasingly, land conflicts and conservation are concerns of the phosphate industry. Moreover, since it is a low-value bulky commodity, transport costs may account for half the delivered price. These factors, not resource shortages, have supported the search for alternative sources, of which the marine phosphorite nodules are perhaps the most significant.

Phosphorite nodules generally contain around 20 percent P_2O_5 and occur under a few hundred to a few thousand feet of water (Mero, *op. cit.*, pp. 57-73. See also the series of three articles by M. P. Overall, "Mining Phosphorite from the Sea," *Ocean Industry*, September, October, and November, 1968). There has been at least one unsuccessful attempt to recover them, but they continue to hold interest for agricultural areas far from other sources of phosphorus and for underdeveloped nations that must import it in large quantities.

Some Conclusions—We have dealt with the economic setting only in rather general terms, but fortunately there is no need to get specific. While there are good reasons to think that mineral demand will grow significantly through the end of the century, there are equally good reasons for thinking that mineral supply is capable of filling that demand at prices no higher, or at least not much higher, than present prices.

So far as ocean mineral resources are concerned, the implication is that the oceans are one of, but only one of, the potential sources of supply that man might utilize over the same period of years. Indeed, the number of alternative sources of supply appears to be widening, not diminishing, with time, which, to return to Boulding once more, suggests that intellectual capital really is being accumulated at a rate faster than that at which geologic capital is being depleted.

II. Onshore vs. Offshore Sources

The conclusion of Part I is hardly new. It has been the almost unanimous position of those who have taken the trouble to look at the situation. Unfortunately, all too often, the matter has been left at that point, just when it is getting interesting. If ocean mineral resources will not come to be mined because of scarcity, additional analytic steps are needed to clarify what their role may be.

Assuming that marine mining is now or soon will be *technologically* feasible, the additional steps must involve *economic* feasibility. "Economic feasibility" is commonly taken to be synonymous with commercial profitability, but it can also mean

social productivity. In this latter sense, which will be the focus of this section, one is not so much concerned with the direct costs and potential revenues of ocean mining as with the economic side effects and socio-economic consequences of decisions to engage in offshore rather than onshore production.

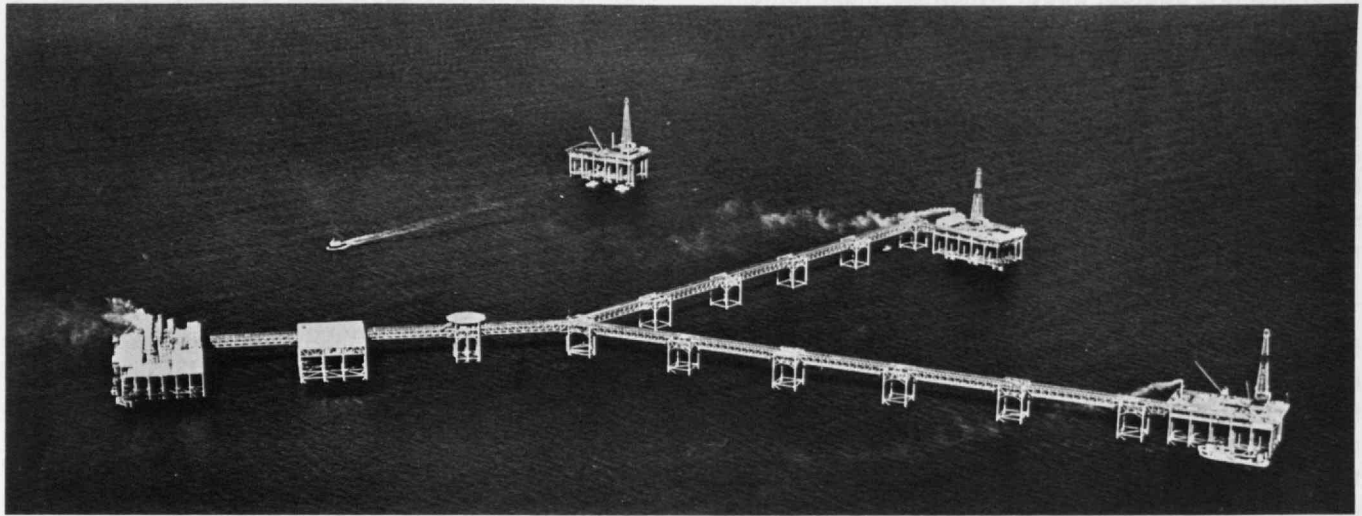
Just as in Part I, we need a point of departure. A useful approach is to assume that the nation can satisfy its needs from either onshore or offshore domestic sources at the same delivered cost. That is, neither a direct price advantage nor any international complication is at issue. Actually, this is a reasonable assumption. From the point of view of the consumer, minerals from the ocean are perfect substitutes for minerals produced from the land. Moreover, it is likely that minerals mined by U.S. ships while in international waters will be allowed to enter the country free of duty. But to the producer and to the nation there are advantages and disadvantages of ocean mining that will influence private decisions about where to produce and public decisions about minerals policy. What appear to be the most important of these?

National Security—Here onshore mining seems to have quite an advantage. Most engineers envision offshore mining as requiring some kind of a tie between the bottom and the surface vessel. This tie would make any ocean venture extremely vulnerable to military action. Exactly the same is true of the need for ocean transport to shore. While an ocean mining venture might have some protection against sabotage which would not be available to an onshore mine, this is a comparatively small offsetting factor.

Regional Economies—A regional economic problem may arise if ocean mining displaces minerals that would otherwise be mined from land deposits in this country. Then it would have the same dislocational impact as would imports: a reduction of output in existing (generally inland) mining centers and greater processing and fabrication along the coast. This would accentuate the present trend toward relative depopulation of rural areas, and it would probably also cause a loss of capital values in townsites, mining equipment, and the like.

Industrial Structure—In addition, regardless of whether ocean mining substitutes for existing domestic production or serves only to supply incremental needs, it will contribute to the trends toward larger size and increasing concentration in the extractive industries. This is an almost inevitable result of the fact that the capital investment required for ocean mining is high and, at least for the early ventures, risky (David B. Brooks, "Deep Sea Manganese Nodules—From Scientific Phe-

Grand Isle, one of the two deep-water sulfur mines at present in operation. (Photo: U.S. Bureau of Mines, Department of the Interior; FreePort Sulfur Company)



nomenon to World Resource," in *The Future of the Sea's Resources*, Proceedings of the Second Annual Law of the Sea Institute, ed. Lewis M. Alexander (Kingston, R.I.: U.R.I. Press, 1968), pp. 35-36). These factors themselves would force firms to consider the advantages of larger operating units and joint ventures.

But the situation may be more difficult than that. If direct operating costs, relative to capital investment, are quite low, efforts to achieve high rates of production will be stimulated because anything made beyond out-of-pocket expenses helps to pay off this investment more rapidly. Only large units, relatively well shielded from classical competition, will be willing to undertake such a venture. In part, this problem stems from the common property ownership of those minerals occurring beyond the continental shelf, but to some degree it inheres in the nature of the resource itself (*ibid.*, pp. 35-37).

Research Spillover—In contrast to the three areas just discussed, the benefits of research may be one area in which ocean mining has an important advantage over conventional. This will be the case if advances in ocean technology are adopted by other sectors of the economy, or at least by other marine-based industries.

Admittedly, this has not proven to be the case with space technology; relatively little spillover has been noted. But the oceans are used by many industries, and there are many marginal resources that could come to be commercially exploited. Thus, a greater opportunity for capturing spillover effects exists right now than may ever be the case with space. In addition, some techniques needed in marine mineral recovery may prove applicable to onshore mineral resources. Such transfer is perhaps unlikely in the mining stage, but the techniques to separate minerals of very fine grain size might have applicability to certain onshore deposits.

Land Conflicts—Offshore mining may have another advantage over onshore mining in the matter of "land" use. It seems likely that ocean mining can avoid some of the conflicts that are arising with increasing frequency on land. Multiple use is a wonderful concept so long as one use does not preclude another, but this is exactly the situation in many controversies such as those over mining activities in recreational areas. Typically, these activities are not, and in some cases cannot be made to be, compatible. It would be ironic if the broadest applications for multiple-use concepts turn out to lie in the oceans rather than on the land, but this

is not too far-fetched (Walter R. Hibbard, Jr., "Off-shore Petroleum and National Gas: A Marine Resource of Increasing Importance," in *The Future of The Sea's Resources*, *op. cit.*, p. 54. See also William L. Griffin, "Accommodation of Conflicting Uses of Ocean Space with Special Reference to Navigation Safety Lanes," *ibid.*, pp. 73-83). In both the North Sea and the Gulf, methods have already been developed to accommodate marine mineral exploitation and other, apparently conflicting, uses of the sea.

Pollution—Finally, despite a number of statements to the effect that marine mining will be pollution-free, this is a subject about which we must remain agnostic. If it does prove to be true that marine mining presents fewer waste disposal problems than conventional mining, there would indeed be an advantage. Pollution abatement is already requiring considerable expenditure by mining firms, and the lower grade resources that are coming to be mined will increase the impact of mining on the environment. However, it is also known that dredging in in estuarine areas can cause considerable damage.

But would the same be true in deeper water and different bottom conditions? There is simply too little information presently available to determine whether, or under what conditions, the disturbance to the bottom by ocean mining will adversely affect other valuable resources or ocean ecology. Nor do we know what it would cost to alter mining practices to avoid any such effects that turn up.

III. Feasibility: Political and Economic

We began this discussion with a quotation on geological capital. While philosophical in intention, it was deliberately chosen, for mineral deposits are appropriately considered as pieces of capital. As with any piece of capital, the value of a deposit is the present value of the net cash flow recoverable from its exploitation. The obvious question is whether this value will be high enough to attract investment funds from prospective mining firms and the necessary support from national governments, given the fact that alternative onshore sources of supply are available.

The oceans, after all, represent a kind of extensive margin of exploitation, just like the opening of new lands to cultivation, and it is usually necessary for both direct economic returns and broader socio-economic forces to be operating in concert before exploitation of an extensive margin is undertaken.

Moreover, there is still another factor, one that at present almost overshadows questions of technological and economic feasibility. This involves the political regime for the deep ocean minerals. While minerals occurring on continental shelves out to at

least 200 meters of water depth belong to the adjacent coastal nation, those in deeper water lie in a most ambiguous pool of conflicting interpretations. (Articles 1 and 2 of the International Convention on the Continental Shelf grant to each nation sovereign rights for exploration and exploitation of mineral resources of adjacent submarine areas out "to a depth of 200 meters or, beyond that limit, to where the depth of the superjacent waters admits of the exploitation of the natural resources of the said areas." This open-ended definition is causing no end of trouble, and almost every discussion of legal regimes focuses on it.)

How will rights to exploit deep-sea mineral resources (including petroleum) be distributed, and who will have claims on the returns from their exploitation? Such questions were implicit in the technological advances which, by the late 1960's, had made drilling in water deeper than 200 meters quite feasible, and made recovery of hard minerals from the deep sea seem a reasonable prospect. If questions of distribution were implicit in the technology, they became manifest when Ambassador Arvid Pardo of Malta placed the whole question of the peaceful use of the oceans on the 1967 Agenda of the General Assembly of the United Nations. Moreover, his action changed the grounds of the discussion from that of revenue distribution alone to the far more substantive matter of whether the resources of the oceans are perhaps the common heritage of all mankind, not subject to national appropriation, but rather to be used so that all nations directly or indirectly profit by them.

The possibility of U.N. action and the probability that there were profits to be made, at least from petroleum, beyond the 200-meter line forced opinion to crystallize in this country. By somewhat over-simplifying, we can divide the resulting positions into two groups.

On the one hand, there are the "nationalists" who advocate either that national jurisdiction be extended to the 2500-meter line or that firms ought to be able to win exploitation rights simply by establishing bona fide mining or petroleum claims. (The position for extension of national boundaries has been well stated by the National Petroleum Council and summarized by Hollis D. Hedberg, "Some Matters of Concern to the Petroleum Industry," Proceedings of a Symposium on Mineral Resources of the World Ocean, Occasional Publ. No. 4, Grad. School of Oceanography, Univ. of Rhode Island (1968), pp. 88-95. See also the statement of the National Oceanography Assn. in a news release "National Ocean Rights Pushed" (September 1968). The "claim" system has been strongly put forward in numerous papers by Northcutt Ely of Ely and Duncan, Washington, D.C.)

Alternatives for Ocean Policy

On the other hand, there are the "internationalists" who urge relatively narrow limits to national jurisdiction, and an international regime beyond, which would lease mineral resources and dedicate the returns to some international purpose like economic development (Francis T. Christy, Jr., "Economic Criteria for Rules Governing Exploitation of Deep Sea Minerals," *The International Lawyer* (January 1968), pp. 224-42; and *The United Nations and the Bed of the Sea*, Nineteenth Report of the Commission to Study the Organization of Peace (New York: March, 1969), 30 pp. As one of the drafters of the latter report, I must confess my bias in this controversy.).

Rather surprisingly, the weight of opinion seems to be shifting toward the "internationalist" position. The possibility of a colonial race to claim vast areas of the ocean bottom seems more remote than it did just a year or two ago. Recent disarmament proposals give promise of effective restrictions on the use of the seabed for military purposes. And, perhaps most important, the major industrial nations, which are the only ones with the capability and the capital necessary for deep ocean exploitation, seem to be agreed that there is *some* portion of the ocean floor that should be dedicated to "international community purposes." (David M. Popper, "Present U.S. and International Policy," Proceedings of a Symposium on Mineral Resources of the World Ocean, *op. cit.*, pp. 80-87. See also the draft resolution of the United States presented in the Report to the 23d Sess. of the General Assembly by the "Ad Hoc Committee to Study the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction" (New York: United Nations, 1968), pp. 54-56.)

The last position of course begs the critical question of just where the line between national and international jurisdiction is to be set. If it is set at the 2500-meter isobath, the principle would be almost meaningless because exploitation at greater depths is unlikely for at least another decade. If, however, it is set near the 200-meter isobath, the United

Nations or a specialized agency would have to begin acting as a resource manager within the next few years.

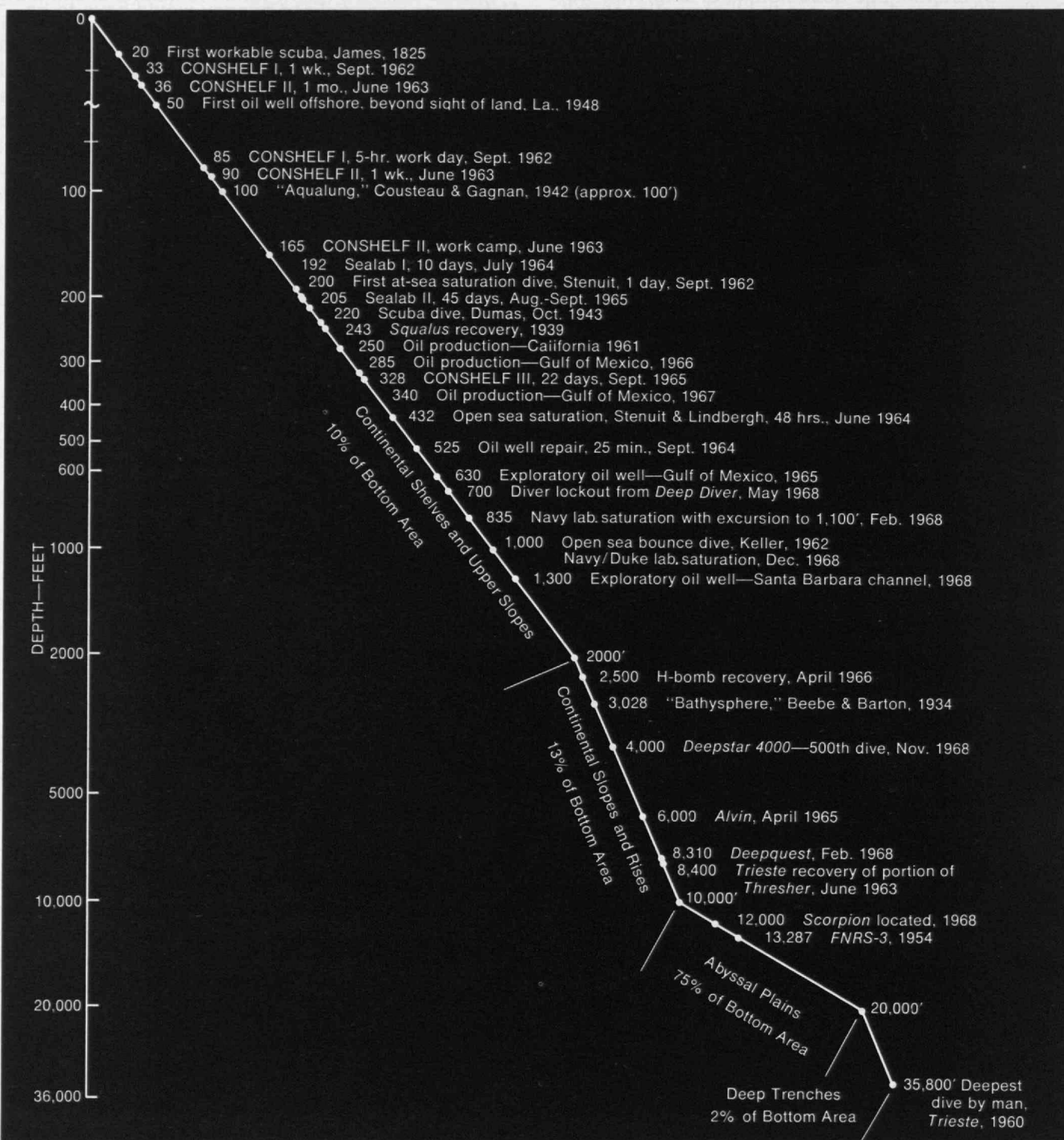
Recently a middle position has been defined in the Report of the Commission on Marine Science, Engineering and Resources—the "Stratton Report," so named for its Chairman, former M.I.T. President Julius A. Stratton. This report is undoubtedly the most comprehensive review of national marine policies to date—and the most forward looking. Among many other things, the Commission recommended that a relatively narrow national shelf be adopted, but that a wider "intermediate zone" be defined from which revenues would be shared by the coastal state and an "international fund" (*Our Nation and the Sea* (Washington, D.C.: Govt. Printing Office, 1969), pp. 141-57). For areas in still deeper water, an exclusively international managing authority was proposed.

More generally, the Stratton Report urged "that the United States seize the opportunity for leadership which the present situation demands and propose a new international legal-political framework for exploration and exploitation of the mineral resources underlying the deep seas, . . ." (*ibid.*, p. 147).

This is an awesome charge. Yet, no less is required, for we must develop a stable institutional structure, capable of winning respect throughout the world community, if the geologic capital lying in and on the bottom of the oceans is in fact to become an efficient source of economic capital.

David B. Brooks is an economist with an early training in geology (he graduated in geology and geophysics at M.I.T. in 1955). He has been a professor of economics at Berea College, Berea, Ky., and prior to that spent five years with Resources for the Future Inc., Washington, D.C., as research associate. This article is not an official publication of the Bureau of Mines; the views expressed are those of the author.

This chart shows the key events in man's penetration into the sea. Significant dates not associated with specific depths were:
 1933—commercial recovery of bromine from seawater
 1941—similarly, of magnesium
 1956-58—development of the nylon purse seine
 1961—first million-gallon/day desalting plant (Freeport, Texas)
 1967—first use of seawater for city water supply (Key West, Fla.)
 (Chart: "Our Nation and the Sea, a Plan for National Action")



The Marine Science Commission Report offers useful guidelines for sea development, but it contains debatable suggestions for international control

Norman J. Padelford
Professor of Political Science, Emeritus, M.I.T.

Alternatives for Ocean Policy

Multiple pressures are forcing nations to "go down to the seas" anew. The motives are more pragmatic than the poet had in mind, however—more raw materials, increased supplies of foodstuffs, new energy sources, and more effective defense.

The oceans constitute 71 per cent of the earth's surface. Within the restricted land space left for man must be accommodated the needs of 3.5 billion people today. And somehow we must find room for the estimated 6.5 billion expected in the year 2000. Secretary of the Interior Walter Hickel has suggested, in hailing the aquanauts who lived for 60 days under the sea in Project Tektite, that in the future "whole new cities" may be constructed under water.

The world yield of food per capita, almost stationary since 1950, strongly suggests that new supplies must quickly be found. The ocean is capable of producing much larger harvests than the fishing industry is now gathering if new equipment, better methods and careful cultivation replace the archaic means being used in many places. The world need for fish is expected to grow by an additional 40 million tons (67%) by 1985, according to latest estimates of the Food and Agriculture Organization of the United Nations.

The increasing depletion, and rate of use, of mineral resources on land suggest increasing demands on marine supplies (see David Brooks' article in this issue). One result will almost surely be to aggravate the existent pollution problem. The condition of the ocean near principal cities makes us painfully aware of the quantities of noisome wastes being dumped into the sea. As more oil wells are drilled on the continental shelf and 300 to 500,000-ton super tankers become commonplace, the risks of pollution will rise exponentially.

All of these issues suggest the need for national and international discussion of the general direction in which ocean policy should be moving. Should the federal government mobilize an effort

comparable to that employed in developing nuclear energy to accomplish new missions in the ocean? Or should private enterprise be left to get what it can with the means at its disposal, as the oil industry has done, restricting the role of government to licensing, overseeing, setting quotas, insisting on competition, and possibly controlling prices?

How far should the United States go in cooperating with others, inside or outside of the United Nations, in joint surveying, mining, and food production—or in the search for new laws? Should we support the creation of new international machinery to control the use of the sea beds in the interests of mankind?

The issues at stake are complex. What is done on some of them now will affect the freedom of choice on other matters later, regarding not only our livelihood but our power and influence in world affairs as well. A time of decision is at hand.

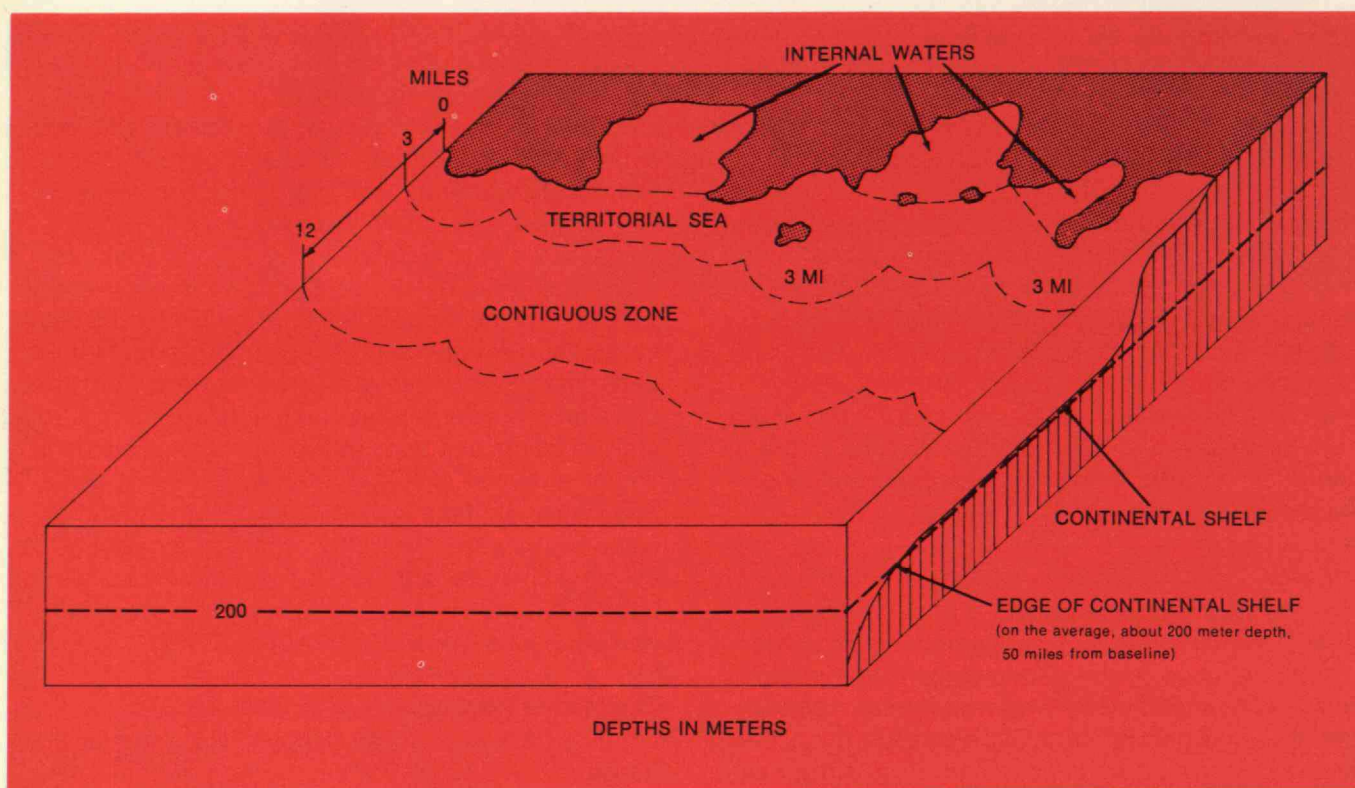
The Marine Resources Act of 1966

Impetus for a new ocean policy in this country began with a recommendation by the National Academy of Sciences in 1959 for a 10-year national effort to extend research and knowledge of the seas, to draw additional manpower into marine science and engineering, and to develop new vehicles for underwater activity.

Portions of this program were advanced by Presidents Eisenhower and Kennedy. But it remained to the 89th Congress to pass the first comprehensive ocean legislation in several decades—the Marine Resources and Engineering Development Act of 1966. This placed the Congress on record in favor of federal support for education, research and technological improvements in marine engineering, and affirmed the intention that this country remain a leader in ocean science and engineering.

It created the National Council on Marine Resources and Engineering Development, under the chairmanship of the Vice President, to replace the ineffectual Inter-Agency Committee on Oceanog-

Most states now make limited claims to areas 3 and 12 miles from shore, although some claim much more. The Stratton Commission recommends limiting national jurisdiction to 200 meters' depth or 50 miles out, whichever gives the greater area. (Chart: "Our Nation and the Sea: a Plan for National Action")



raphy. To this Council the Congress gave the power to initiate programs, to integrate the activities of 27 government agencies, to assign responsibilities, and to advise the President.

In its first three years, this Council has brought a measure of order into the national ocean picture. The task of fashioning a long-range ocean strategy has begun. The federal budget for spending on ocean research has risen from \$20 million in 1960 to \$400 million in 1968-69.

The 1966 Act also made provision for the appointment of a Presidential Commission to formulate recommendations for a more "adequate" oceanic program, together with proposals for a permanent administrative structure within the federal government. The report of this Commission on Marine Science, Engineering and Resources (chaired by Julius A. Stratton, President Emeritus of M.I.T., now

Chairman of the Ford Foundation), entitled *Our Nation and the Sea: A Plan for National Action*, is now before the government for action.

The Stratton Commission Plan

President Nixon has yet to make his response to the Commission's plan for action. Meanwhile, the Congress has begun hearings on the proposals. It is difficult to predict what will eventually issue from the congressional mill. Much will depend upon the tenor of the President's recommendations.

Dr. Stratton and his colleagues, drawn from government, private enterprise, and academic life, have exercised care to keep key members of the Congress informed. Wisely, the Commission had a four-member, bipartisan, team of congressmen as advisers—Senator Norris Cotton, Senator Warren Magnuson, Congressman Alton Lennon, and Congressman Charles Mosher—which included the

chairmen of the two committees through which new legislation must pass, together with ranking minority party members.

Briefly, the Commission recommends that research in basic marine science be expanded with a diversity of support; that capability be sought to occupy the bed and subsoil of the territorial sea to 2,000 feet, and to explore to 20,000 feet by 1980; that undergraduate education in ocean engineering be broadened and support for graduate programs be expanded. At the same time the Commission stressed the need for the country to have a few very strong national laboratories for work in ocean science.

For management of the coastal zone the Commission finds the present federal, state, local machinery inadequate, and favors a coastal management act.

On pollution, it is recommended that the Army Corps of Engineers be given power to refuse permission for the construction of new plants that would affect the purity of waters. Federal enforcement procedures should be reviewed.

In the realm of fisheries the Commission recommends continuing federal subsidies for rehabilitating the U.S. domestic fisheries; encouraging conservation; establishing priorities for the development of new species; developing better fishing technology; expanding support for the production of fish protein concentrate; and entering into stronger international arrangements to rationalize total sea catches. Shipbuilders may be horrified (while economists may be heartened) at the thought of opening the door to the use of foreign-built shipping, which is generally cheaper, while allowing American industry to concentrate on other activities in which it excels, such as packing and processing.

Although it recommends support for advancing aquaculture, the Report does not give this the emphasis which the urgent needs of the world suggest, given what is known about Japanese, Chinese, Malay, and other Asian practices in intensive fish cultivation.

As to marine minerals, "strong federal support" is urged for a program to advance the fundamental technology of undersea mining and recovery.

Professional oceanographers, as well as the Navy and ocean engineers, are given emphatic support for a long-range program of research, exploration, and advancement of technology. Activities visualized here include, among other things, expanding data networks; studying ocean systems and con-

tinental drift; major research efforts in marine biology; supporting studies of advanced deep ocean stations, man-in-the-sea projects, and stable off-shore platforms; advancing knowledge and capability in deep ocean technology with new submersibles and instrumentation; improving environmental prediction and studying the feasibility of modifying the global environment.

The International Decade of Ocean Exploration, announced a year ago, should be helpful in furthering many of the activities mentioned, although specific agreements will be needed where coordinated endeavor is required.

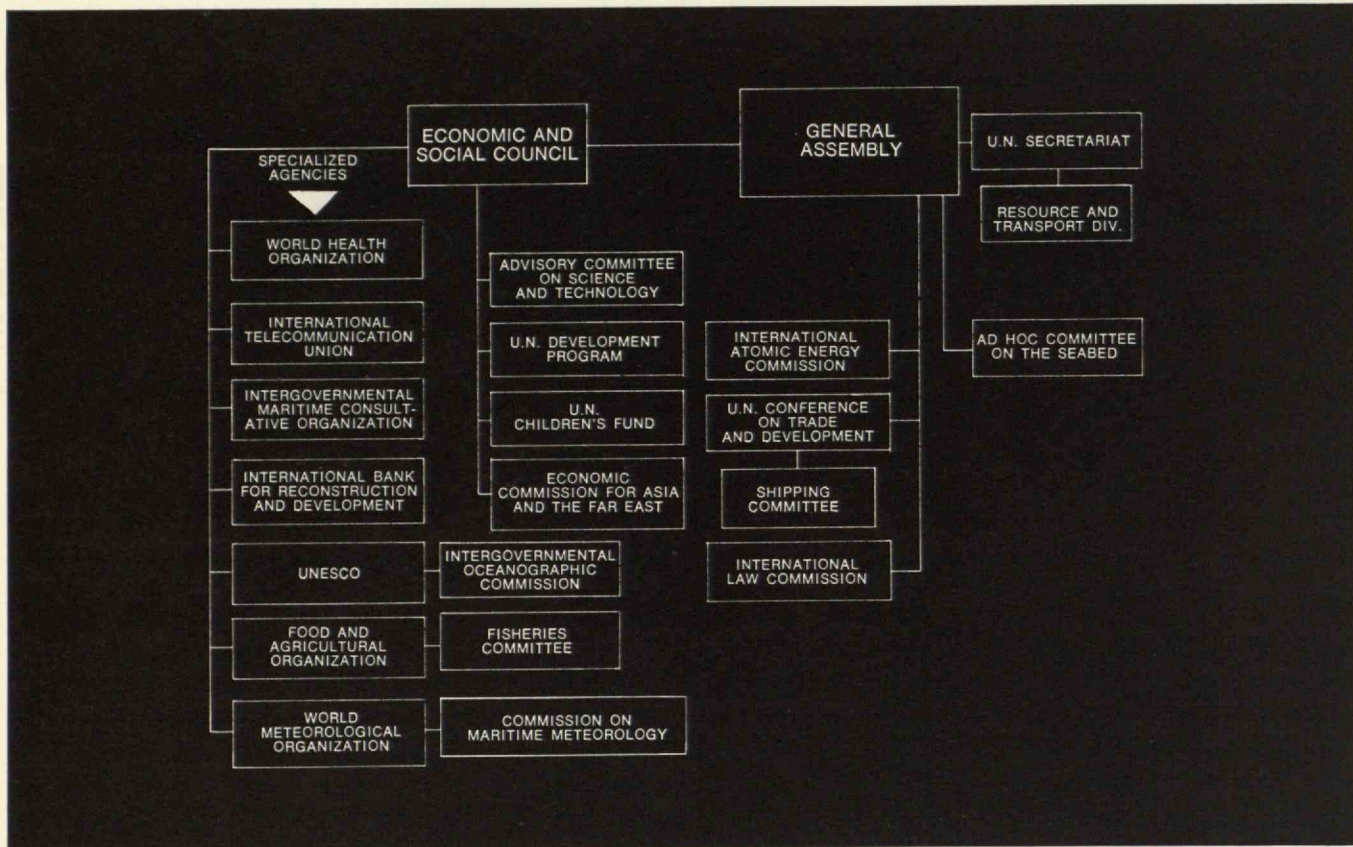
The recommendations have built solidly upon the foundations laid in 1959 by the Committee of the National Academy of Sciences. They give impressive backing to the pleas of the scientific community for strong leadership in oceanic affairs. They afford a blueprint for ocean policy for the decade to come, as envisaged by the 1966 legislation. The responsibility now lies with the Executive and the Congress.

Definition of the Continental Shelf

There are two areas in which the Commission's recommendations may be questioned. One of these is the suggested redefinition of the continental shelf.

The Commission proposes limiting national jurisdiction on the shelf to the 200-meter isobath or 50 miles from shore, whichever gives the adjacent state the greater area. In the area between the 200- and 2,500-meter isobaths, or out to 100 miles from shore, the Commission would have an International Registry Authority give preferential treatment to the claims of adjacent state interests.

This formula would deprive states of rights which they now enjoy under the 1958 Geneva Convention on the continental shelf—primarily, the right to control who shall work the seabed in front of their territories—and give an international body the



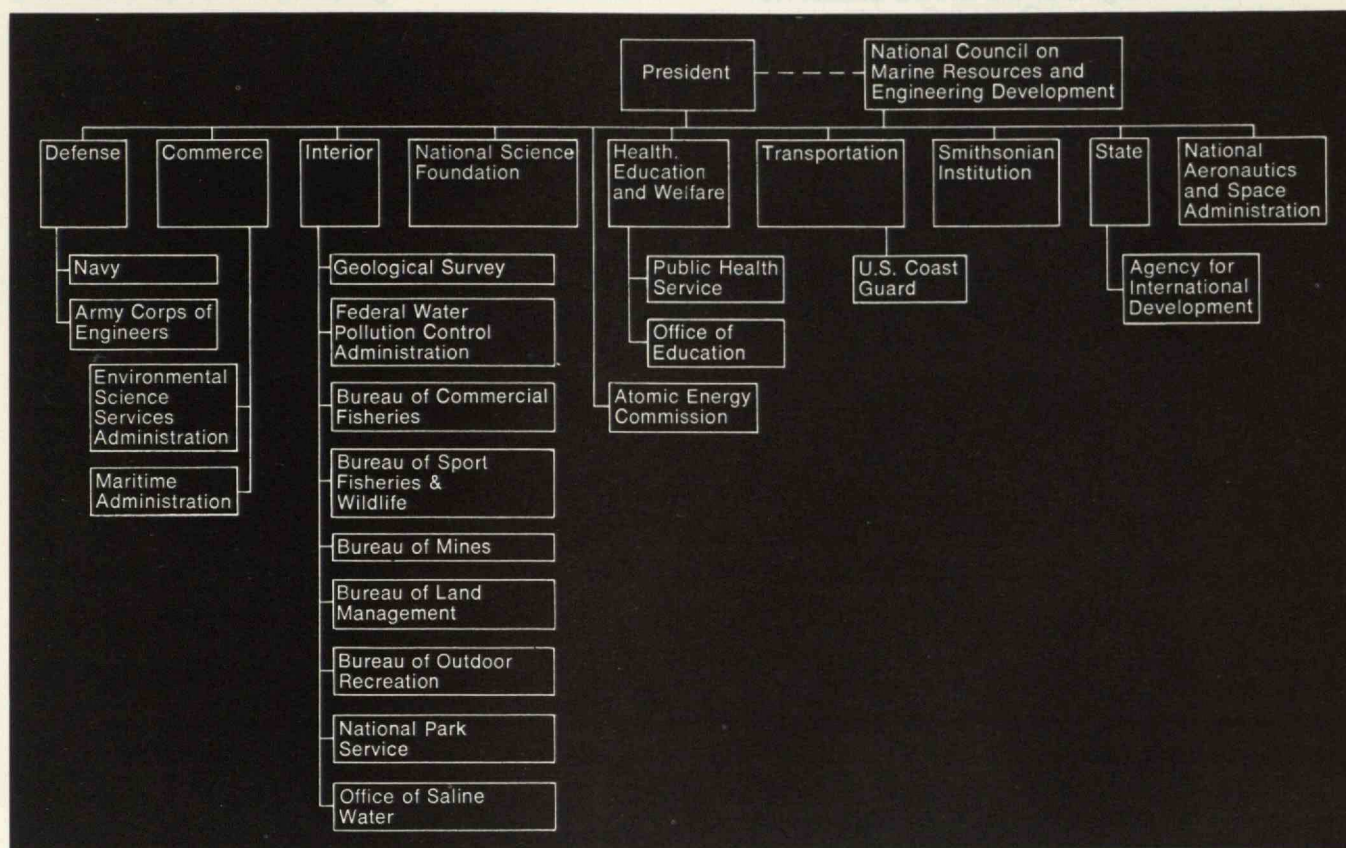
right to make money by granting exploratory and exploitation leases—at fee rates of its own fixing—to nationals of the state itself, as well as to foreigners, in vital security areas off their own shores.

Historically the oceans have been viewed by international law as being the property of no one beyond territorial limits. The right of states to control the use of the offshore sea has been a prerogative of sovereignty. Assertions of jurisdiction in the territorial sea have for the most part been exercised with restraint. Most states have limited claims to three and 12 miles. A small handful have claimed exclusive rights for as much as 100 or 200 miles.

Claims to resources lying on or beneath the floor of the continental shelf date to 1945. In that year President Harry S. Truman asserted exclusive title to the resources of the shelf surrounding the territories of the United States. This was motivated by a desire to ensure national possession of mineral resources in the shelf, and by a fishing controversy which had existed with Japan prior to the war.

Other states followed suit as more was learned of the potential importance of resources on the continental margins. Ecuador, Peru, Chile, and some other Latin American states utilized President Truman's proclamation—which explicitly disavowed claims to jurisdiction of the waters and over navigation above the shelf—to advance territorial claims reaching out as far as 200 miles from shore. Few of the states had knowledge of the resources lying on or beneath their shelf. In the case of Argentina, this move afforded a convenient additional means of claiming title to the Falkland or Malvinas Islands occupied by Britain. For the states on the west coast of South America it gave grounds for restricting the operations of foreign vessels engaged in tuna fishing off their coasts.

After a decade of intensive study by national authorities and international legal groups, the Geneva Conference on the Law of the Sea, at which a majority of maritime nations were represented, agreed to a definition of the continental shelf which is incorporated in the Convention on this subject.



This reads as follows:

"... the term 'continental shelf' is used as referring to the seabed and subsoil of the submarine areas adjacent to the coast but outside the area of the territorial sea, to a depth of 200 meters or, beyond that limit, to where the depth of the superjacent waters admits of the exploitation of the natural resources of the said area . . ."

At stake in the difference between the Commission's proposal and the text of the 1958 Convention is the exploitation of the slope and the rise in which the continental shelf typically terminates. It now appears possible that the slope and rise may be important areas for mineral and energy sources; indeed, the U.S. Department of Interior is reported to have issued leases extending on to the slope.

Within a few years the petroleum industry will have the capability of working on the slope. One of the wells in the Santa Barbara Channel is said to have been drilled in water 1,300 feet deep. And the

Glomar Challenger on her recent voyage in the South Atlantic is reported to have drilled corings of the ocean floor in depths up to 19,000 feet.

To tie the hands of industry and government in those portions of the continental margin lying beyond the 200 meter isobath by a redefinition of the shelf could take away valuable resources from national control.

There is doubt to what extent it would be advantageous to reopen the Geneva Convention at this time. There are more parties with interests in the shelf today than there were in 1958. Also, a multiplicity of interests now focus in the boundary of the shelf—notably defense, navigation, fishing, mining, and foreign affairs. Each is interlinked with the others.

The boundary at the continental margin cannot be settled according to historical analogies on land. Considerations of geological structure, exploitation and competence to employ technology are more

applicable. The most vital factor is that the slope and rise are an integral part of the land mass of a continent. There is no natural dividing line.

Where numbers of nations border upon shallow seas that extend from shore to shore—as along the North Sea and the South China Sea—satisfactory arrangements have been arrived at. No serious international disputes exist over the boundaries of the continental margins of the United States. No nation is challenging United States rights to control the use of the resources lying within its continental margin. Discussions at the United Nations relate primarily to the seabeds of the high seas.

Rather than reopening the laboriously negotiated Geneva Convention to try to reach a new generalized definition of the shelf, it would seem better to delineate the shelf on a pragmatic basis, instance-by-instance, as occasions arise—particularly in view of the limited extent of today's knowledge about the underlying character of the shelf in many parts of the world.

The "intermediate zone" proposed by the Commission is also open to objection. Rather than holding national jurisdiction in the seas within strict limits, as United States policy has always tried to do, this idea would, in my opinion, encourage states to expand their claims to exclusivity toward the 100-mile line in order to obtain title or bargaining power over the maximum potential resources possible. The situation could end up more confused than it now is.

More seriously, the "intermediate zone" idea would entitle an international body to interfere within an area which numerous states hold to be vital to national security. The United States has an aircraft identification zone (A.D.I.Z.) that extends out several hundred miles into the Atlantic and Pacific, for example. Should an international body be given rights to inspect, police, and control leases within such areas, disputes could arise that would hardly be in the interests of peace and security.

It proved impossible between 1958 and 1960 to enlarge the area of agreement on the law of the sea beyond that incorporated in the Geneva treaties. There is no indication that the nations are prepared to go farther today. On the contrary, the area of agreement appears to be narrowing.

In relation to national defense, the values of the slope and rise in particular are just beginning to be seen. As capability to work here becomes an accomplished fact, use of this region for listening, detection, housing defense installations, and other purposes will multiply in much the same way as outer space technology has opened up new vistas of concern for national security there.

International Licensing Authority

A second area in which the Commission's recommendations are open to challenge is in relation to the proposed International Registry Authority. The Commission recommends that the United States take leadership in negotiating agreements that will establish an International Authority to register national claims for exploring and exploiting areas of the deep sea bottom beyond the redefined continental shelf.

The nations would undertake not to engage in or authorize action without first registering a claim to a particular area. On a "first-come, first-registered" basis, registration would give "the exclusive right to engage in or authorize such exploitation in a large enough area and for a long enough time to enable the producer to operate economically . . . and to recover its original investment as well as an adequate return thereon. The size of the area covered by the claim and the term of years for which it is registered should be fixed by the Authority."

By alert maneuvering, foreign parties might succeed in laying claims to extensive tracts of seabed on the outer edge of the continental shelf off the coast of Maine or off the South Atlantic states, where the shelf extends out more than one hundred miles. Should this occur, it would allow alien parties to become lodged on our doorstep regardless of local security or economic interests.

It is desirable for the United States to take leadership in world affairs, but it is questionable whether this particular suggestion is in the larger national interest. An I.R.A. would be allowed to give away rights to resources in areas physically joined to the American land mass where these could be developed by American industry, and would require states to pay fees—which an Authority composed of a majority of the newer countries would be tempted to set high.

It is difficult to believe that the Congress of the United States will favor such a give-away program, or support an international authority that will have the power to "inspect all stations, installations, equipment, and other devices" in claimed areas. This sounds close to an authority with supranational powers over states.

The establishment of an international agency for settling conflicting claims on the abyssal sea floor or over midoceanic ridges or seamounts may eventually be in order. There is ample machinery now in existence, however, for settling such disputes whether by political means, or by arbitration or judicial settlement. Many states have bilateral arrangements with others for mixed claims procedures. Nearly all states are members of the Per-

manent Court of Arbitration and of the International Court of Justice at the Hague. It hardly seems necessary to pile Ossa on Pelion further simply because there is increased activity in the oceans. Each additional layer of authority multiplies the costs and red tape.

Federal Organization

At the national level, the Marine Science Commission has proposed a grouping of ocean activities under a National Oceanic and Atmospheric Agency—N.O.A.A.—in place of the existing National Council on Marine Resources and Engineering Development.

By law the National Council will continue in being until the Congress passes new legislation creating some other arrangement. The National Marine Council has done a commendable job of initiation, coordination, and direction in the past two years under the leadership of Vice President Humphrey. On the other hand, the Council is limited in its power to act. It is a poor competitor for funds and impinges heavily upon presidential staff time. Above all it is not an appropriate vehicle for a strong operating agency with mission tasks that stretch across a wide spectrum of concerns—scientific, engineering, industrial, governmental.

The Commission on Marine Science is correct in saying that "a system relying upon coordination of organizationally dispersed activities" is not a substitute for a "single operating agency having authority and capability commensurate with the scope and urgency of the national ocean program."

The suggestion of forming a new department of government has merit, but would involve surgical severance of numerous agencies from their present departmental ties. There is reason to believe this would be resisted within some of the more powerful departments, and might entail unhappy ties with other associates.

The proposed National Oceanic and Atmospheric Agency would initially encompass the Coast Guard, the Environmental Sciences Services Administration, the Bureau of Commercial Fisheries, the Sea Grant Program, the National Oceanographic Data Center, and some other bureaus. It would leave other activities where they are now located in the Navy, Interior, Transportation, State, and other departments, together with N.A.S.A., the Atomic Energy Commission, and elsewhere.

This compromise would bring some related activities together, leaving problems of coordination still to be resolved with others. The arrangement will, if carried through, assemble under one roof approximately 55,000 employees, some 320 vessels,

numerous aircraft, the principal oceanographic laboratories, and other facilities. Such a team would command a strong leader and a good manager.

Coordination of activities left under the responsibility of other agencies would be vested in the head of N.O.A.A. The same responsibilities now reside with the Executive Secretary of the National Marine Council, but the head of N.O.A.A. would be stronger because he would have a large operating organization behind him. But the Congress must make it clear in its legislation, if it accepts this plan, that the head of N.O.A.A. is to have such a function, under the direction of the President, and that his role is to be supreme in this respect.

With the precaution suggested, the National Oceanic and Atmospheric Agency could mark a constructive step forward, comparable with N.A.S.A., the Office of Science and Technology, and the Atomic Energy Commission.

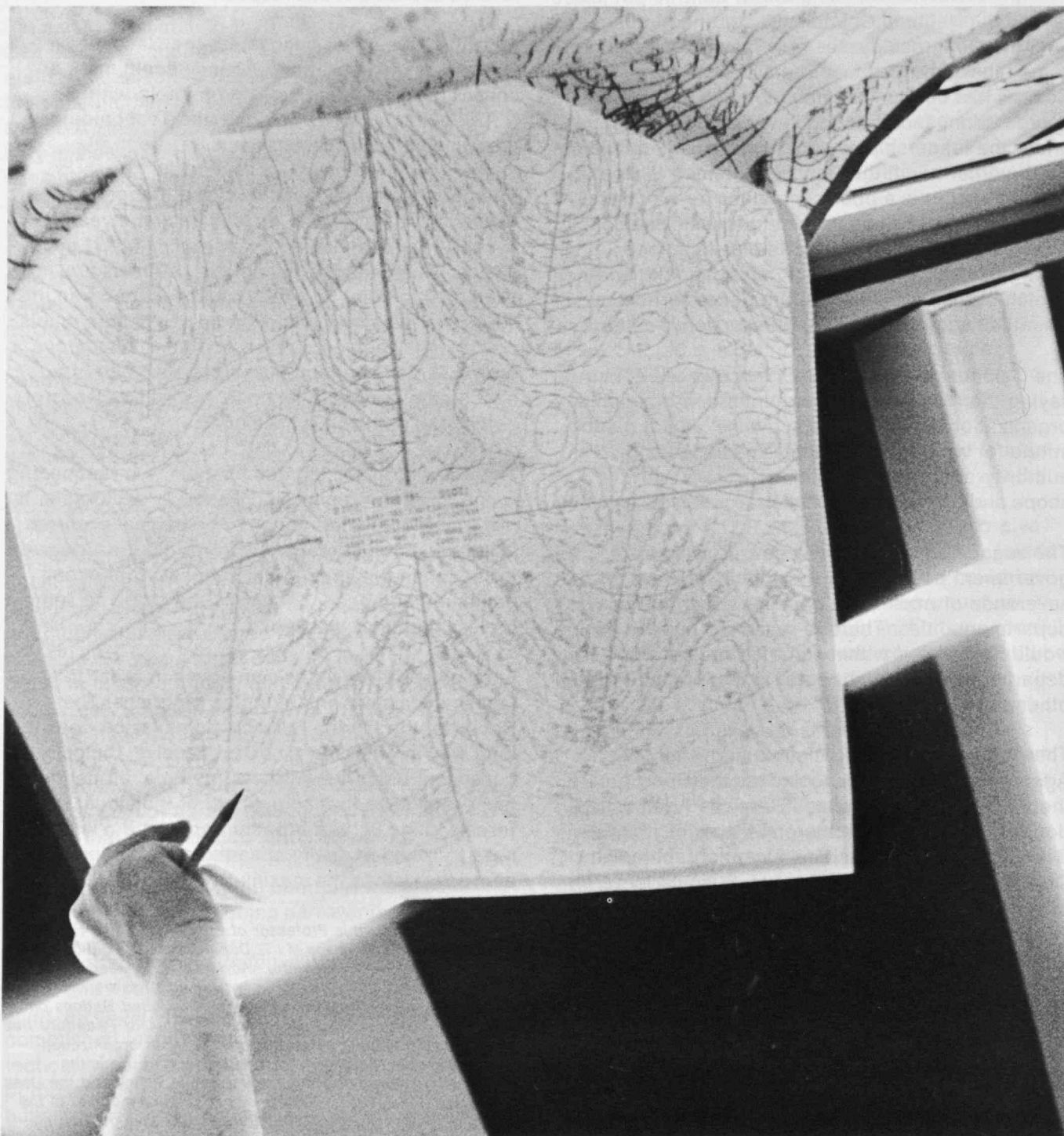
The program recommended by the Commission would cost on the order of \$650 million a year between 1971-75, and by 1980 approximately \$1 billion a year. Taking the 10-year period, the costs are estimated to come to a total of \$8 billion. Given the squeeze that is now mounting on tax dollars in this country and the competition of other major programs, there is serious question how much of a chance the Marine Science Commission stands of getting the dollars it is asking for.

The delay of the Nixon administration in responding to the Stratton Commission Report is deplorable. It may not fatally undermine congressional progress, for there is considerable steam within the Congress for action in this area, but it suggests that ocean engineers and oceanographers may have to settle for less than they would like.

Each nation must set its own house in order to establish consistent and effective programs. The Report of the Marine Science Commission goes a long way in affording a comprehensive, logically consistent blueprint. At the same time, all nations must recognize that adjustment of individual interests in the light of broader needs and a willingness to reach mutually advantageous arrangements afford the path to the maximum benefit of all.

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"It is the instability of the atmosphere which makes it less predictable than tides and eclipses. It is instability which renders empirical methods of prediction only moderately successful. Knowing that we cannot predict into the indefinite future, we face the question, 'How accurately can we hope some day to predict the weather at any specified range?'"



Next month's weather is influenced by unobservably small details of today's; day-to-day weather forecasts beyond three weeks seem inherently impossible

Edward N. Lorenz
Professor of Meteorology, M.I.T.

How Much Better Can Weather Prediction Become?

Man may have first decided that he could learn to predict the weather after becoming aware that certain regularities mark the sequence of weather events; for example, dark clouds often foretell the outbreak of a heavy shower. No doubt he was subsequently encouraged by discovering that certain other natural phenomena, such as oceanic tides and solar eclipses, could be predicted far in advance with considerable accuracy. Today we are more inclined to base our belief in predictability on the existence of a set of physical laws according to which the present state of the atmosphere and its environment determines the future.

If such laws prevail, it might seem that we have only to perfect the technique of applying them, in order to put weather forecasting on a par with eclipse forecasting. Indeed, such an achievement has been the stated goal of some utopians. Yet recent evidence points against its fulfillment, despite the physical laws. Because of a combination of circumstances, there appear to be certain limitations on predictability which no system of forecasting can ever hope to overcome.

A prerequisite for an accurate forecast of a future state of the atmosphere is an accurate knowledge of the present state or some recent past state. The mere fact that the governing laws picture new states as evolving from earlier states is *not* sufficient to assure us that this is so. Governing laws also describe new states of the tides as evolving from older states, yet ordinarily we base our predictions of the tides upon the anticipated configuration of the moon, earth, and sun, disregarding the state of the tide at the time we make our prediction.

To be sure, we can say something about future weather from the time of the day and the year alone. We can predict with near certainty that next summer will be warmer than last winter, and, in some climates, drier, in others, wetter. Yet over much of the globe the weather variations of greatest interest are those associated with migratory areas of storm and calm—systems which cannot be foretold by the

calendar and the clock alone, and whose progression has not been observed to follow any precisely periodic pattern. No procedure for predicting these variations which does not take the current state of the atmosphere into account has proven itself any better than guesswork.

The weather recognizes no international boundaries; a storm which is centered in France today can appear in Germany or Poland tomorrow. Hence, from its inception about a century ago the practice of weather forecasting has demanded a degree of cooperation among even those nations which might have been disinclined to cooperate in other matters. As the various nations have established and continually enlarged their networks of weather stations, they have striven for enough uniformity in their observing procedures to render the data useful to everyone.

With several thousand weather stations reporting winds, pressures, temperatures, humidities, cloud forms, and other weather elements at least twice daily, it might appear that a rather complete picture of an instantaneous state of the atmosphere could be constructed by interpolation. Unfortunately, this is not the case. Even over more populous regions, where neighboring stations are typically a hundred miles apart, an intense thunderstorm between stations may go unreported. Over the oceans and away from the principal shipping lanes and airline routes, an entire tropical hurricane may remain undetected. Satellite photographs are now revealing storms and other systems which might not have been discovered otherwise, but they do not capture the atmosphere's complete three-dimensional structure (see Dr. William K. Widger's "*Meteorology by Satellite*," *Technology Review* for July/August, 1968, p. 35).

Plans to correct the most serious deficiencies through an international "World Weather Watch" are in progress. Yet no matter how dense the network of stations may become, there will always be still smaller irregularities between stations which

How Much Better Can Weather Prediction Become?

will be unrecorded. There is considerable justification for the claim that the useful information is contained in a smoothed weather pattern, with the irregularities eliminated, but if an irregularity occurs at an observing station, and is not recognized as such but treated as a point observation of a smooth trend, we shall obtain the wrong smoothed pattern. Thus one of the prerequisites for a perfect forecast—a perfect knowledge of current conditions—can never truly be attained.

Craft or Mathematics

Traditionally weather forecasting has been a subjective procedure; if not an art, it has at least been a craft rather than a science. The forecaster begins with the present and recent past observations; so that they will not constitute an unmanageable jumble of facts, they are arranged as a set of weather maps. The forecaster first analyzes the most recent maps—he or one of his colleagues will have analyzed the earlier maps before issuing the previous forecast—identifying such systems as high and low pressure areas, warm and cold air masses, and fronts. He then estimates the future position, intensity, and shape of each system, taking care to introduce new systems whose formation seems to be indicated, and to remove systems which appear to be disintegrating. From his prognosticated weather pattern he ultimately deduces the weather conditions at specific points of interest.

At times he may make use of the governing physical laws, but ordinarily he bases his estimate on the way in which the existing systems have been behaving, and on his knowledge of how similar systems have behaved on previous occasions. He must be able to decide when the present weather situation truly resembles some earlier one with which he is familiar, and when the resemblance is only superficial. He must learn to recognize the various signs of storm development and decay, just as the physician learns the symptoms of specific illnesses.

One can well imagine that there will be occasions when the forecaster relies too heavily upon one sign

and too little on another. At times the current weather situation will be unlike any which he can recall. A poor forecast will be the inevitable result. Many forecasters regularly conduct post-mortem discussions, and sometimes, after a forecast has failed, they are able to identify some feature which, had it been given greater attention, would have led to a proper forecast. On other occasions they may find no indication that what did happen was about to happen. Yet the governing physical laws seem to imply that the indication must have been there. The resulting disillusionment with current subjective methods has led some forecasters to seek procedures which, once perfected, will no longer rely upon human judgment and alertness.

The most highly developed objective method of forecasting is a dynamical method, popularly known as "numerical weather prediction." Here the governing physical laws are formulated as a system of differential equations. The particular solution of these equations for the case when the initial conditions represent the present state of the atmosphere is then sought. The method was proposed many years ago, but the equations are so highly non-linear (effects disproportional to causes) that the only known methods of solving them are numerical (a brute-force arithmetical procedure) and these were impractical before the advent of high-speed digital computers.

In the United States the method became operational in the middle 1950's; refinements are continually being added. Numerical forecasts prepared by a central computer at the National Meteorological Center are issued to the various forecasting offices. Such forecasts are ordinarily presented as sets of prognostic weather maps, indicating the expected locations and intensities of the various weather systems. Under current procedure, the local forecaster is not bound by the numerical forecast if his judgment tells him that something else should happen; however, the numerical forecast is there as an additional piece of information, and he is likely to be heavily influenced by it.

In principle this dynamical method should produce an optimum forecast, but in reality there are several reasons why the forecasts fall short of perfection. First of all, the governing laws are not strictly deterministic. We need not invoke Heisenberg's Principle of Uncertainty to justify such a statement. It is sufficient to note that the weather is affected at least to some extent by human activity, which we hesitate to consider predetermined. Local cumulus-cloud convection, for example, may be initiated or intensified by fires. Such inadvertent weather modification has in recent years been supplemented by conscious attempts to alter the weather for man's benefit (see, for example, Dr. Frederick Sargent's "*Weather Modification and the Biosphere*," *Technology Review for March, 1969*, p. 42).

A more important consideration at present is our incomplete knowledge of the governing laws. We do not know, for example, precisely what determines when a cloud consisting entirely of minute water droplets will become converted into a cloud containing larger drops, which will then fall out as rain. Such lack of knowledge can disrupt a forecast far more than any uncertainty as to the location of fires and other man-made features.

However, the current failures of numerical forecasting stem most of all from our inability to formulate the laws as equations which can be solved by digital computers, without distorting the laws in the process. The familiar partial differential equations treat the atmosphere as a continuum, but the computer is a finite instrument, and it must represent the state of the atmosphere by a finite collection of numbers. Usually the numbers are values of the weather elements at a prechosen network of points, and finite differences from point to point and moment to moment replace the partial derivatives (smooth gradients) of the equations. Inevitably, some of the finer details such as thunderstorms are omitted, not only at the initial moment (when they are likely to be unobserved in any case) but throughout the period of the forecast. Yet these details exert a continual influence upon the larger sys-

tems, and cannot be disregarded. We generally try to include their effects by introducing coefficients of turbulent viscosity and turbulent conductivity (thus acknowledging the existence of smaller-scale phenomena, without being specific about them), but we do not know the most appropriate values for these coefficients, nor have we proven that appropriate values even exist. Our inability to observe the present state of the atmosphere without error is therefore accompanied by a similar inability to extrapolate the state into the future without error, if dynamical procedures are used.

Prediction Without the Laws

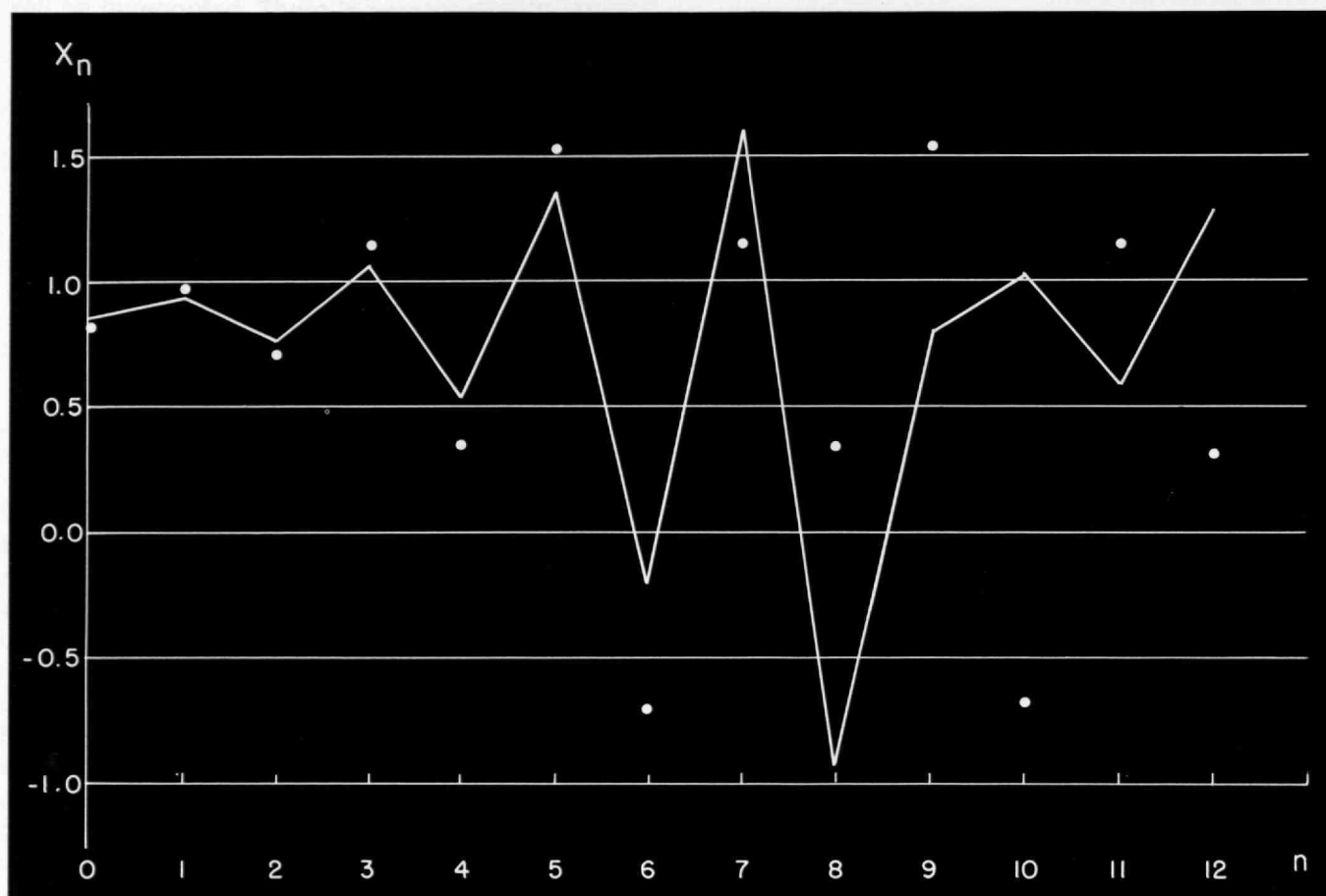
A forecasting procedure does not have to be dynamical to be objective. In recent years considerable attention has been devoted to empirical methods; these have also depended heavily upon the computer.

Prediction by linear regression is the empirical method whose mathematical theory has been most highly developed. Here we express the predicted value of some observable weather element as a linear combination of a chosen set of observable predictors; the coefficients of this combination are discovered empirically. No maps need be analyzed, and the specific weather conditions do not have to be inferred from prognostic maps.

For special tasks where methods currently in use are significantly but only slightly better than guesswork, such as predicting the general trend of the weather a month in advance, linear regression may give the best results. For the regular daily forecast the method has not compared favorably with subjective or dynamical procedures. Evidently the dominating terms in the governing equations are too highly nonlinear to be readily approximated by linear functions of the present and past weather.

We therefore turn to an empirical method which incorporates all the inherent nonlinearity—the method of analogues. Here the computer examines the entire recorded history of the atmosphere, or a

Instability may be illustrated by a simple equation, as below. Starting with an initial number $X_0 = 0.84$, we have generated a sequence of numbers X_1, X_2, \dots using the difference equation $X_{n+1} = 1.64 - X_n^2$ ($X_1 = 1.64 - (0.84)^2 = 0.9344$, etc.). The heavy line connects successive numbers of the sequence. The dots show the numbers which would have been predicted by the same equation if X_0 had mistakenly been observed as 0.82. The initial error of 0.02 would have increased after five steps to 0.176 and after 10 steps to 1.718, whence the prediction 10 steps ahead would have been worthless. The equations governing the atmosphere are vastly more complicated than simple difference equations, but mathematically the phenomenon of instability is similar.



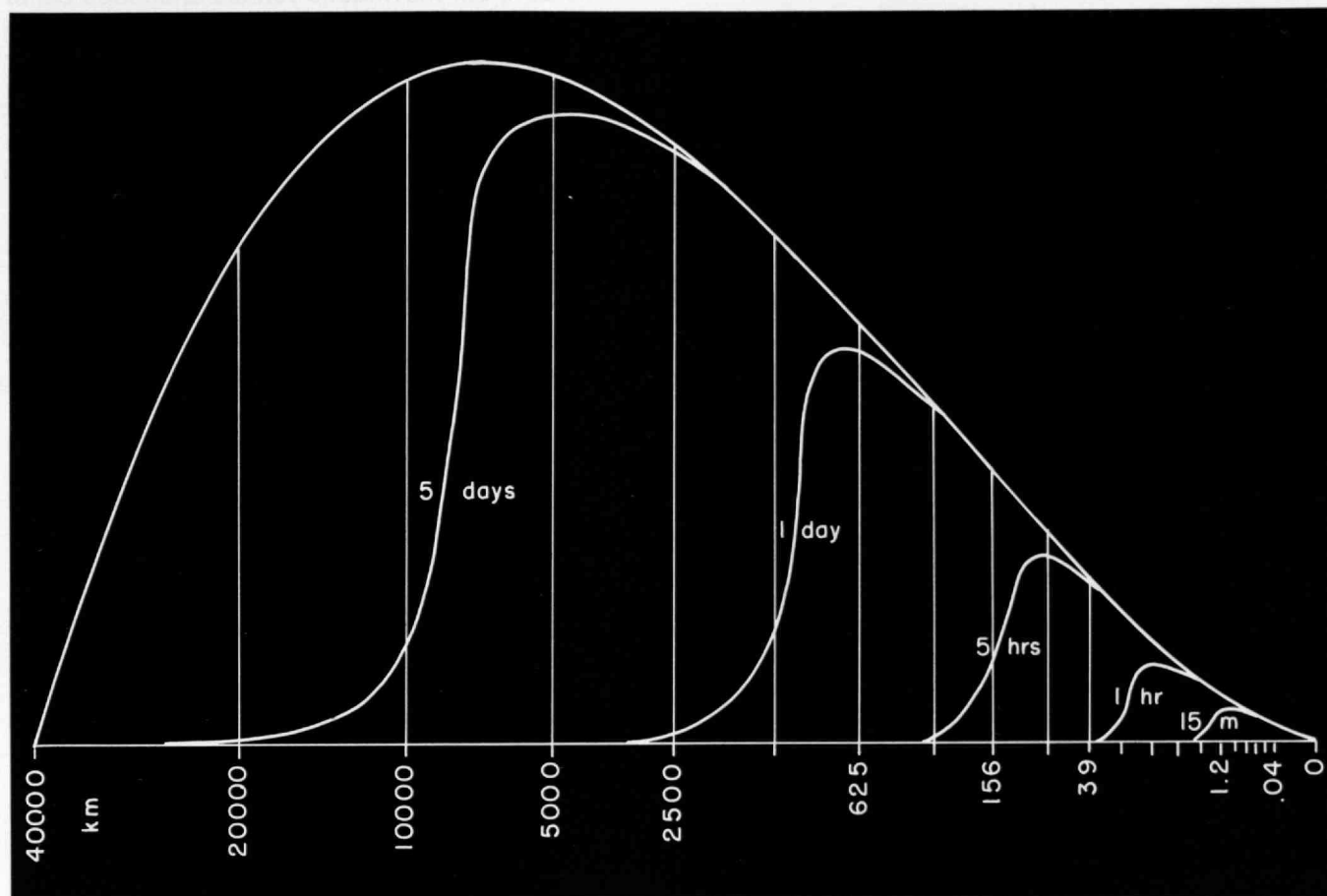
significant portion of it, to discover an analogue for today's weather, i.e., a previous state of the atmosphere resembling today's. The weather which followed the analogue state is then used as the forecast.

In principle the analogue method, like the dynamical method, should yield an optimum forecast. If two states of the atmosphere are alike to within the limits of observational error, either the subsequent states will be alike, and the analogue method will produce the correct forecast, or the subsequent states will not be alike, in which case no systematic procedure would have produced the correct forecast on both occasions.

In practice the method has not been particularly successful. For predicting one day in advance, it might be sufficient to have the analogue state resemble the current state over a rather limited area; for predicting several days ahead the resemblance should cover a fair portion of the globe. Reasonably complete three-dimensional states of the atmosphere have been observed on a daily basis over the northern hemisphere for no more than 25 years. The chances of finding a good analogue for a given state within this period are extremely small. To be competitive with dynamical forecasting as it is currently practiced, the analogue method would probably require many thousands of years of recorded weather data.

The upper curve shows an idealized spectrum of atmospheric kinetic energy against wavelength. The area under the curve between any two vertical lines is proportional to the amount of energy contained in systems having wavelengths between the values indicated. The curves labeled 15 minutes, 1 hour, 5 hours, 1 day and 5 days are theoretically determined spectra of the mean-square error in predicting the velocity field at those time ranges. Thus, scales of motion greater than 2500 kilometers are almost perfectly predictable one day ahead, while scales less than 625 kilometers are almost completely unpredictable at that range. (Because of numerous assumptions entering the computations these results should not be regarded as the final word.)

Subsequent studies which the state of the atmosphere was represented by as many as 100,000 numbers seemed to confirm a disturbing law of some kind that a small error in the initial conditions would lead to a large error in the final conditions.



These considerations indicate that perfect weather forecasting is at present unattainable, but they do not by themselves preclude the possibility of eventually producing forecasts of high quality at both short and long range. Although we cannot wait long enough to acquire the data needed to make the analogue method operationally feasible, there is no obvious upper bound to the accuracy with which the weather may some day be observed, nor, aside from the slight lack of determinism, to the precision with which the laws may be formulated.

The Growth of Small Differences

The additional circumstance which places a limit upon the ultimate accuracy of weather prediction

is the atmosphere's *instability*. Specifically, two states of the atmosphere which closely resemble one another will, in evolving according to the governing laws, ultimately develop into vastly dissimilar states. Stated otherwise, two solutions of the governing equations, originating from slightly different initial conditions, will ultimately diverge (page 42).

How can we be certain that this is so? Mathematical theory has not advanced to the point where we can examine any given system of nonlinear equations and say whether the general solution will be unstable. Our principal evidence is the nonperiodic nature of the atmosphere, which we have already mentioned.

If a system is stable, it will in the absence of non-periodic external influences acquire a completely periodic behavior. Stability and periodicity must be carefully defined to render such a statement capable of rigorous mathematical proof, but the general line of reasoning may be presented qualitatively.

The number of possible states of the atmosphere, each bearing no resemblance to any other, is limited. Hence, if the atmosphere is observed over a sufficiently long interval, a pair of reasonably good analogues can be found; the longer the interval, the better the analogues. If the atmosphere were stable, it would behave similarly following the occurrences of either analogue state. History would repeat itself, and the atmosphere would be periodic. All our observations clearly indicate that this is not the case. (Of course, there is always the possibility that the atmosphere really is periodic, with a period longer than its observed history, but this is highly improbable.) We may therefore take it that the atmosphere is not stable.

Consider now two states of the atmosphere, one of which is the exact present state, and the other of which is the best attainable estimate of the present state, containing the inevitable errors of interpolation. These states, we have seen, will eventually evolve into states bearing little resemblance to one another. It follows that even the most perfect prediction technique cannot yield good forecasts at indefinitely long range. Imperfections in the technique will only aggravate the problem.

It is the instability of the atmosphere which makes it less predictable than tides and eclipses. It is instability which renders empirical methods of prediction only moderately successful.

Knowing that we cannot predict into the indefinite future, we face the question, "How accurately can we hope some day to predict the weather at any specified range?" The answer to this question depends upon *how rapidly* separate solutions of the atmospheric equations diverge from one another.

It is convenient to regard the difference between any two states of the atmosphere as an "error"—the error one would make if he mistook one state for the other. We then face the question, "How rapidly do small errors grow?"

This was one of the questions asked in the early 1960's by a Panel on International Meteorological Cooperation headed by J. G. Charney, charged with evaluating the probable effectiveness of an all-out effort to improve the world-wide observation system. The Panel noted the possibility of a dynamical approach to the error-growth question; separate solutions, initially slightly different, of the equations which had proven effective in numerical weather prediction could be determined and compared.

We have seen that the equations of numerical forecasting are not exact; neither are they the product of a single person or a single working group. Thus it was inevitable that different investigators would develop different systems of equations, each with its own distinctive features. By the early 1960's three groups—those of J. Smagorinsky at the U.S. Weather Bureau, Y. Mintz at U.C.L.A., and C. E. Leith at the Lawrence Radiation Laboratory—had developed equations which seemed suitable for investigating the growth rate of errors. In each case the state of the atmosphere was described by a few thousand numbers.

Following a special conference in 1964, each investigator agreed to use his equations for this purpose. The results of the separate computations did not agree. Mintz found that after an initial period of adjustment, small errors in winds and temperatures would tend to double in about five days. Smagorinsky deduced a considerably slower growth rate, while Leith obtained no systematic growth at all. It appeared, however, that Leith's atmosphere was varying nearly periodically, whence—by the above "stability" reasoning—little error-growth was to be expected. In Smagorinsky's and Mintz's experiments, the growth rate subsided as the errors became larger.

In their report to the National Academy of Sciences, the Panel concluded that a reasonable estimate of the doubling time for small errors was five days. It was felt that the hoped-for improvement in observation might reduce the initial error of observation to one-eighth of the tolerable error of prediction. Thus day-to-day forecasting up to two weeks in advance (i.e. three doubling times) appeared possible, and was accepted by some as a goal.

Subsequent studies where the state of the atmosphere was represented by as many as 100,000 numbers seemed to confirm a doubling time of somewhat less than a week. However, even the most detailed equations cannot circumvent the problems raised by the presence of small-scale features. Thus we can never be sure that the results deduced from the equations are valid for the atmosphere itself. It therefore behooves us to seek other means of estimating the growth rate.

Error-Growth from History

Such means are afforded by an empirical approach, which is based upon the analogue method of forecasting. If two states qualify as analogues, either state is equivalent to the other plus a small error, and the growth of the error may be studied by observing the behavior of the atmosphere following the two states.

In practice we cannot expect to encounter any good analogues within the brief recorded history of the atmosphere. We may therefore observe the growth only of moderately large errors. These errors should have a longer doubling time than small errors (in the extreme, once an error has become as large as the difference between randomly chosen states, it should undergo no further systematic growth). By studying mediocre analogues, we may hope at least to obtain a maximum estimate for the doubling time of small errors.

We have recently completed such a study in the Statistical Forecasting Project of the Meteorology Department at M.I.T. Our basic data have been about 10,000,000 numbers—the elevations of three constant-pressure surfaces, twice daily for five years, at a network of 1000 points covering most of the northern hemisphere. We have compared each state of the atmosphere with each other state occurring within one month of the same time of year, but in separate years, thereby comparing altogether about 400,000 pairs of states.

There are indeed no truly good analogues. In fact, the smallest differences encountered are already more than half as great as the difference between two states chosen at random (which can never double at all). On the average, the smallest errors amplify by nearly 10 per cent in one day; thus it

may be inferred that truly small errors would need not more than eight days to double—a result which, incidentally, is in agreement with the numerical experiments.

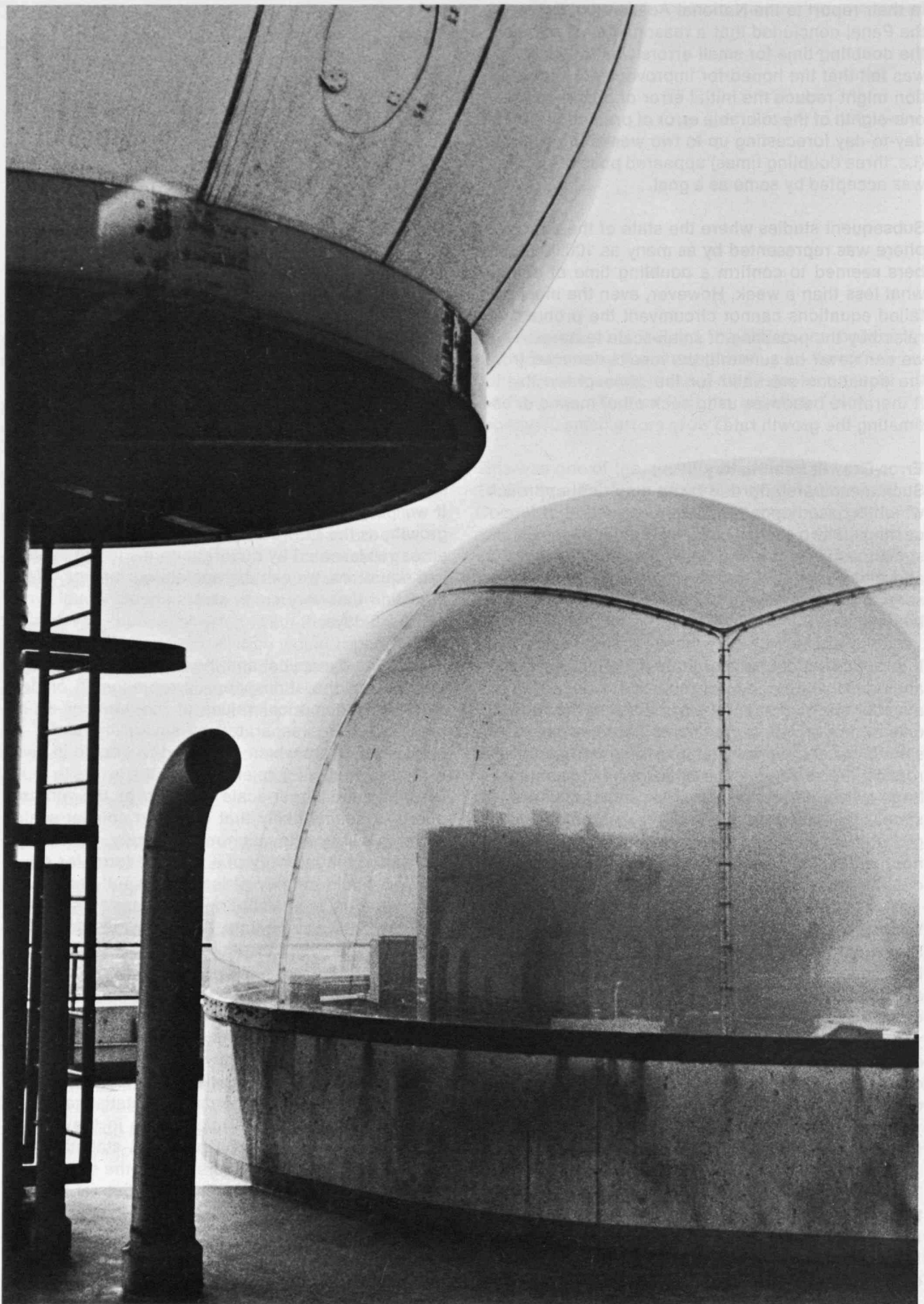
Presumably, however, the doubling time for truly small errors is considerably less than that of the smallest errors encountered in this analogue study. If we postulate that the eventual cessation of growth, as the errors become larger, is due to processes represented by quadratic terms in the dynamical equations, we can extrapolate our results. We then find that very small errors should double in about 2.5 days.

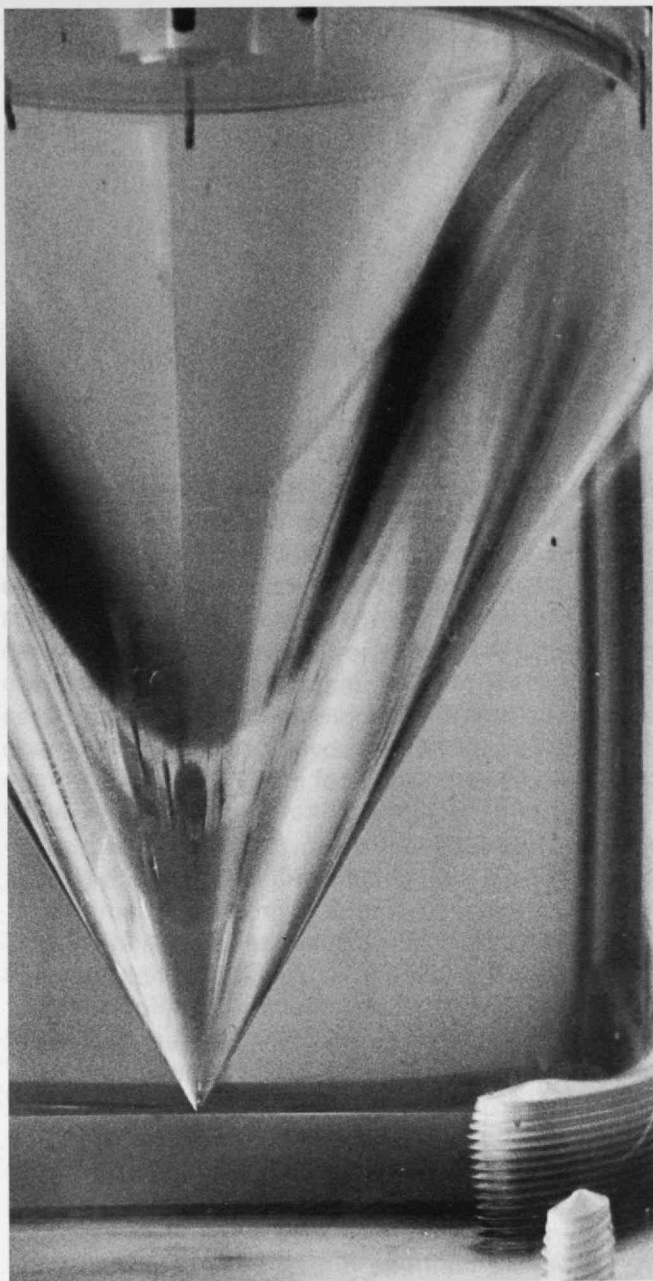
In both the dynamical and the empirical procedures the state of the atmosphere is represented or described by numerical values of the weather elements at points separated by several hundred miles. The errors which are found to double in several days are therefore exclusively the errors in representing the larger-scale features of the atmosphere. It seems likely that errors in smaller-scale features will double much more quickly. An error in estimating the intensity of a thunderstorm, for example, should amplify at least as rapidly as the thunderstorm itself, doubling in perhaps 20 minutes. At the same time, this error may be instrumental in producing errors in the larger scales.

The Statistics of Errors

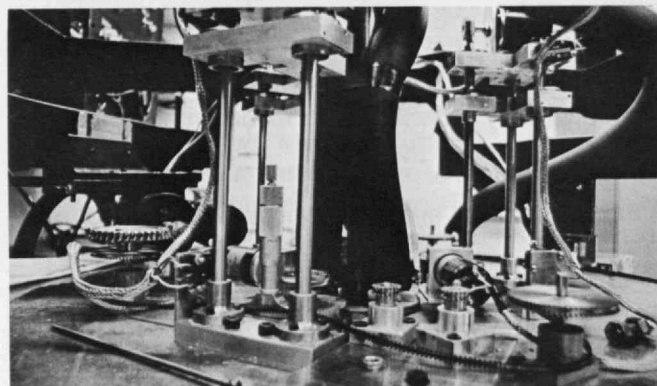
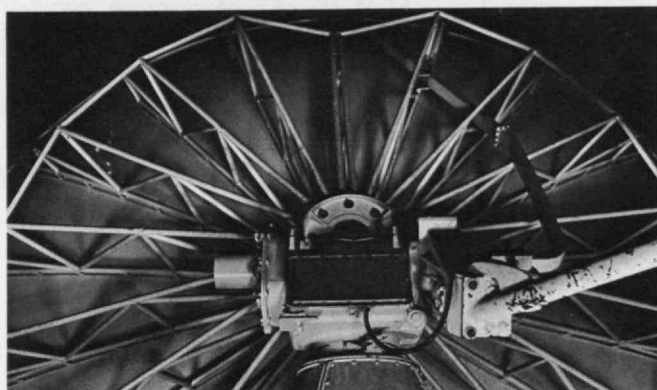
A third approach to the question explicitly takes this possibility into account. The new approach is partly dynamical and partly empirical. From the original atmospheric equations, we may derive a new set of equations governing the statistical properties of the errors. The coefficients in the new equations are based upon observed statistical properties of the atmosphere itself—the spectrum of amounts of motion on different scales (or wavelengths) (see chart, page 43).

The Statistical Forecasting Project has also completed a study of this sort. We have derived a system of 20 equations in 20 unknowns; each unknown

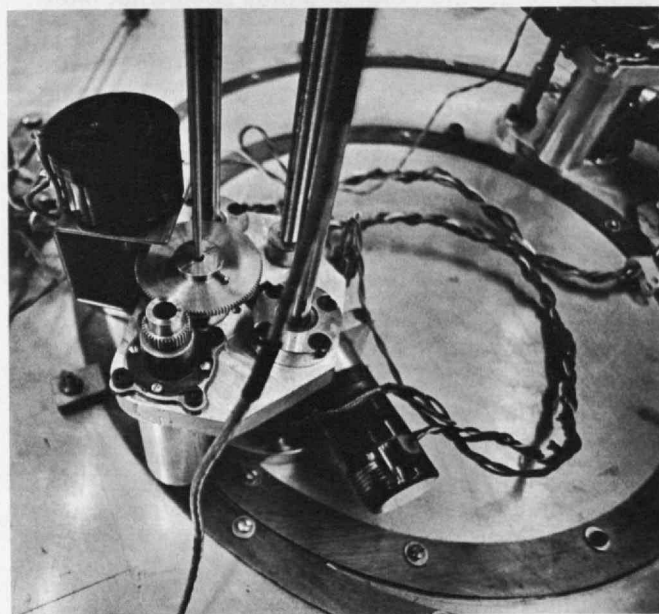




Today's meteorologist benefits from increasingly sophisticated technology and makes ever more precise computations. "... It might be supposed," writes the author, "that we could continually improve our predictions by refining our observations. It appears, however, that as long as the larger scales are observed with reasonable accuracy, the advantages to be gained by improvements in observing the atmosphere are slight. ... If we could observe all scales down to thunderstorm scale, a further doubling of precision would gain us only a few minutes." (Photos: Benjamin Lifson)



6.77-9
 Friday morning coll. 209/12
 1.082 212
 2.51 45
 5 1:30 410 5
 17 2.25 645 4.2
 $\overline{u^2}$ (Wm)² - 2F 50 min.
 5 250 min
 13



represents the contribution of one "scale of motion" to the mean-square error. Each scale covers an octave of the spectrum, so that wavelengths from 40,000 kilometers down to 40 meters are included. The study represents a first attempt, and in place of actual atmospheric equations we have used equations for two-dimensional incompressible flow.

We find that when the initial error is confined to the smallest scale of motion, it grows very rapidly, at the same time inducing errors in slightly larger scales. These in turn grow slightly less rapidly, and induce errors in still larger scales. In the course of half an hour, errors in the thunderstorm-sized scales have become appreciable, while after two days the errors have invaded the scales associated with migratory storms. Large errors in all scales are present after two weeks.

If the small initial errors are instead contained in the medium or larger scales, they quickly induce errors in the smallest scales, which then proceed to behave as if they had been present from the beginning. Thus in either event the errors in the most rapidly amplifying scales, i.e., the smallest, will soon dominate the field, and only somewhat later will they succeed in inducing additional errors in the larger scales. In other words the errors which prevail after a few hours or a few days in any scale will be mainly the result of *initial errors in the smallest scales*. Now, it might be supposed that we could continually improve our predictions by continually refining our observations. It appears, however, that as long as the larger scales are observed with reasonable accuracy, the advantages to be gained by improvements in observing the atmosphere are slight. For suppose that we somehow manage to halve the errors which we make in observing each scale. The time required for the atmosphere to wipe out this advantage, and hence the net increase in the time-range of our forecasting, will simply be the doubling-time for the smallest scale. If we could observe all scales down to thunderstorm scale, a further doubling of precision would gain us only a few minutes.

Indeed, we may extrapolate our results to the case where arbitrarily small scales are admitted. We then conclude that the atmosphere possesses an *intrinsic* range of predictability of perhaps *three weeks*. At present we are far short of our goal of making the best possible forecasts, and our observation system requires major improvements. However, if the hoped-for improvements are some day realized, still further improvements will not appreciably increase the range of predictability.

Although we feel that the evidence favoring our conclusions is substantial, we must be quick to note that they are based upon a number of assumptions which cannot be rigorously defended. We are a long way from incorporating the true atmospheric equations into our procedure. We are therefore somewhat reluctant to name a maximum range of predictability without including a safety factor.

We must also note that our results apply only to prediction of the weather on a specific date. We say nothing, for example, about the possibility of telling whether next summer will be a warm one or a cool one. What we maintain is that it is not possible to say which days during the coming summer will be the warmer ones or the cooler ones.

The Equations Were Optimistic

A special result of the dynamical-empirical study is that after the errors in those scales which are large enough to appear on weather maps have become noticeable, but before they have become large, further doubling requires somewhat more than two days. This doubling rate is consistent with the one deduced from analogues, but it is appreciably more rapid than that indicated by numerical weather prediction. We must therefore note a particular shortcoming of the latter approach.

In the earlier days of experimentation with the equations of numerical forecasting, it was found that the solutions, after behaving in a reasonable fashion for perhaps several weeks, would suddenly go into wild oscillations, not, of course, observed in

Man-Centered Standards for Technology

nature. Various computational schemes, which by no means duplicate the manner in which the real atmosphere is prevented from blowing up, were eventually devised to overcome this difficulty. It seems likely that these schemes, which prevent certain computational errors from becoming unduly large, may also have a damping effect upon consequences of errors in the data on which the computations are based, and thereby raise the computed doubling time for these above its proper value. We have tested one such stabilizing scheme, devised by A. Arakawa, which Mintz incorporated into his equations, for this effect.

In short we have repeated the dynamical-empirical study, using as coefficients not those derived from the actual atmospheric laws, but the coefficients which would be appropriate if the Arakawa computation scheme were true of the real atmosphere. We got a five-day doubling time, which is the same as that which Mintz got from his equations by the dynamic method. With the more appropriate coefficients, we obtain a doubling time of 2.5 days.

It thus appears that all three approaches yield nearly the same doubling time for small errors, in scales large enough to be resolved by conventional networks. The process of doubling every two or three days begins not at the initial moment, with the smallest possible errors of observation, but after a day or two, with errors induced by the inevitable errors in the smaller scales. Before the errors become intolerably large the rapid growth should subside.

Hope for Short-Range Forecasts

What do these results say as to the possible improvement of weather forecasting? Certainly they offer little hope for those who would extend the two-week goal to a month or more. They are not especially reassuring even for two-week forecasting. In another respect they offer considerable promise.

According to the dynamical-empirical study, if the largest scale of motion not resolved by the obser-

vational network has an intrinsic range of predictability of, say, three days, introducing a fine enough network to resolve all scales of motion (an impossible task, of course), would increase the realizable range of predictability of all the larger scales by just three days. Likewise, improving the network so that the largest remaining unresolved scale has an intrinsic range of predictability of one day, instead of three days, would increase the realizable range of predictability of the larger scales by two days. The latter improvements do not seem beyond our capabilities.

Now, to be able to forecast 16 days in advance as well as we could otherwise forecast 14 days in advance would not be a particularly spectacular achievement. But to be able to predict three days ahead as well as we even now predict one day ahead would be a major accomplishment. It is therefore reasonable to anticipate that one outcome of the current efforts to improve the world-wide observational network will be a new level of excellence in short-range forecasting.

Edward N. Lorenz, Sc.D.'48, is Professor of Meteorology at M.I.T. He received his bachelor's degree in mathematics from Dartmouth College in 1938. During World War II he served as a weather forecaster on the islands of Saipan, Guam, and Okinawa. Since 1955 he has directed the Statistical Forecasting Project at M.I.T., which has been sponsored by the Air Force Cambridge Research Laboratories. The recent work of this project which appears in this article is presented in greater detail in the May, 1969, issue of the Bulletin of the American Meteorological Society, in connection with the Global Atmospheric Research Program currently in progress.



The artifacts of our technological production need to be measured in human—not physical—terms. A new concept of standards must be enunciated, and new institutions must be built to fulfill it

John P. Eberhard
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Man-Centered Standards for Technology

The explorations of the most adventurous minds in any society at any particular time are probably not substantially influenced by the value systems or operational paradigms of that society. But for most of us, the standards which we have institutionalized bring with them a pervasive shaping of the things of our lives, our attitudes towards the goodness or badness of these things, and our plans for the new things we will make. These institutionalized standards range from the very precise basic standards for measuring time, temperature, mass, electrical flow, and light (from which all other physical standards are devised) to the ever-evolving standards of justice determined by our forms of government.

There is a time lag between the felt need for new standards, or the requirements to modify old ones, and the response of the various institutional procedures. Most of our institutions for producing standards have operational procedures—albeit usually very cumbersome—for achieving change. More than 300 organizations are involved in the engineering standards business, and new standards or modification of existing standards can be realized within these organizations if perseverance is brought to the task. Manufacturing firms, though not explicitly in the standards business, nonetheless affect our standardizing concepts; in these cases, changes can be achieved only if there is also some institutional change. But in some other areas, upon which this paper will concentrate, there seem to be no present mechanisms; it may be necessary to create entirely new institutions in order to make visible the new standards which we need.

Most of us are familiar with the standards utilized in commerce and industry for achieving compatibility between manufactured items, like those for screw threads; and we know that these have long been the responsibility of various standards organizations. Operating at their designed efficiency, these activities create a national consensus of manufacturers and consumers; scientific, technical, and professional organizations; and governmental agencies. The price for such comprehensive and

democratic procedures is paid in time delays and compromises on quality. It can take five years to process a new standard, and if a change in existing standards is likely to affect competitive markets (such as recent attempts to introduce plastic plumbing components) the procedures can be used to delay effective action indefinitely. The consumer is represented in this process only in a fictional sense.

But these procedures are more complex in the case of changes in standards resulting from scientific breakthroughs or technological innovations not directly related to organizations in the mainstream of standards management. The computer, for example, has raised many questions regarding previous standards. If it is possible to do in seconds a large number of calculations that once would have taken many lifetimes, then new standards of time must be found which are capable of capitalizing on this ability and which can be responsive to the much more precise measurements being made. Thus the National Bureau of Standards, which has had the responsibility for the precision and accuracy of such standards in this country, devised in 1949 a means for utilizing the vibrations of atoms in the ammonia molecule to control an oscillator with which to drive a clock; and so the computer helped to induce a major change in the method and accuracy of our measurement of time. This shift in our time standard—from one based on the solar system to one based on the vibrations of the cesium atom—in turn required institutional changes in the National Bureau of Standards and in all other organizations associated with standards of time. The computer also brought with it a wholly new group of organizations concerned with computer standards.

Toward New Standards of True Performance

Now the progress of technology, and its growing effect upon our culture, suggests a third dimension for defining standards. We are now beginning to see that the artifacts which we produce as a society—from guns to cities—need to be measured in other than physical terms. There are still many

“... today man . . . intends not only for his personality but for his whole being to enter into the process (of making) Young people are protesting not just materialism, but its particular manifestation in dehumanized processes”

problems of physical fit between the components of such artifacts, and there is still a need for standards related to the properties of such components as defined by the physical scientists. But it is at the interface between man as a user of such objects and the performance of the objects related to his needs that the new paradigms and new standards are so badly needed.

All man-made objects have some impact on us physiologically, psychologically, and sociologically, but our ignorance about these relationships is enormous. We know that they can be both negative and positive. But we find it difficult to answer such apparently easy questions as:

How can we avoid boredom in our work environment?

How can we design transportation systems which are safe to operate?

How can we know that new hardware systems for educational purposes will advance our ability to learn?

And we have no idea of how to answer such difficult questions as:

How do we provide an esthetic content in our physical environment which is a delight?

What can we do to provide communications systems that build a climate of trust?

How do we assure ourselves that advanced technologies to aid in crime prevention are just?

I believe that the development of such standards of measurement will require a whole new way of knowing and observing. We are only now beginning to scratch the surface of the understanding needed to formulate the postulates for such measurement. We need a new epistemology that breaks with conventional concepts of the physical sciences. We need, in short, a whole new science of measurement which includes man—his aspirations, his joys and sorrows, and the quality of his life—as a way of evaluating the inventions of his mind. Man can no longer confine his role to that of observer of the engineering performance of such artifacts; he must

of necessity clutter his view and perturb his observations by including himself within the system by which he measures the benefits.

Standards—Abstract or Real?

The concept of standards implies that there is a model, either physical or abstract, against which comparisons can be made. Physical measurement—length, time, temperature, etc.—begins with an abstract idea and the selection of an arbitrary unit to represent some increment. Thus, having decided on the notion of length as the direct distance between points on a plane, we can select an arbitrary unit, name it a “meter” or a “foot,” define it by an arbitrary distance between two marks on a straight edge, and then declare it a standard. Because usage has made these concepts (and their associated standards) commonplace, we tend to forget that they were once only abstractions.

The idea of rationality in standardization is a derivative of this idea of measuring with numbers. This has penetrated our norms so deeply that if a scientist cannot order his observations into a scheme which provides him with some such scalar relationship—such as more or less, larger or smaller, or hotter or colder—he feels that his observations lack rigor. And lacking rigor, he argues, they must of necessity lack clarity. Yet we love, we try to be just, and we prefer the truth to falsehood, and in these issues which grip our hearts or cause us to search our consciences we expect clarity without formal rationality or numbers.

As Leonard J. Fein of the M.I.T. Department of Political Science has suggested, “There are any number of situations in which human beings, including the most rational among us, prefer to maximize values quite clearly at odds with efficiency, and it is not different for the city. . . . No computerized operation can ever make the final choice except as our programs specify our values.”

Toward Truly Technological Standards

Our dilemma is two-fold. If our standards programs

are to specify our values, and if our values are now more man-centered than object-centered, we lack the standards against which to evaluate such man-centered performance, and we lack the institutional means to develop such standards. It is true that this same dilemma in a philosophic sense has faced societies before ours; and some may argue that the institutions of religion have often performed this function historically. But I believe that I here address a problem different from that of the historical philosophers, in an area with which religious institutions are not prepared to deal. The problem I address is not one of standards for man to live by, or of performance standards required of man by his gods, or even of standards governing man's relationship to his fellow man. I am proposing standards which affect the processes of making the things with which we live our lives—in short, truly technological standards, coloring the things in which we live (buildings or cities) or in which we move around (automobiles or jet airplanes), or with which we communicate (telephones and television), or which control the "metabolic" systems of our cities (power plants and waste disposal units).

The standards we use today reflect the values associated with the industrial revolution of the last century. They are oriented to the machinery with which we make objects and the properties of the materials we use. Lewis Mumford told us in *Sticks and Stones* that "the conditions that make possible good machine-work are, first of all, a complete calculation of consequences embodied in a working drawing or design; to deviate by a hair's breadth from this calculation is to risk failure. The qualities exemplified in good machine-work follow naturally from the implements: they are precision, economy, finish, geometric perfection. When the workman's personality intervenes in the process, it is carelessness. If he leaves his imprint, it is a flaw."

But today man no longer wishes his imprint on the process of making to be considered a flaw, and he intends not only for his personality but for his whole being to enter into the process. This is the crucial

point around which the shift in paradigm is coming. Young people are protesting not just materialism, but its particular manifestation in dehumanized processes.

While it is true that new man-centered standards against which to measure the effectiveness of such processes, and with which to evaluate alternative products produced by these processes, will not in and of themselves induce the needed shift in paradigm, *they cannot be written and cannot be institutionalized without this shift*. This is not a "chicken and egg" problem; it represents a shift in one's view of how to look at old problems. Thomas Kuhn in *The Structure of Scientific Revolutions* illustrates the point this way: an investigator, who hoped to learn something about what scientists took the atomic theory to be, asked a distinguished physicist and an eminent chemist whether a single atom of helium was or was not a molecule. Both answered without hesitation, but their answers were not the same. For the chemist the atom of helium was a molecule because it behaved like one with respect to the kinetic theory of gases. For the physicist, on the other hand, the helium atom was not a molecule because it displayed no molecular spectrum. Presumably both were talking of the same particle but each through his own training and practice.

The same problem occurs with respect to performance standards for housing; those who hold to the existing paradigm of measuring performance in physical science terms will answer differently from those who are concerned with man-centered paradigms. This does not propose that the vapor transmission, heat resistance, structural strength, and other properties of materials used in housing are not of consequence. It means that we cannot move in the direction of a new concept with these properties alone. Housing serves the physiological, psychological, and sociological needs of man, and these must be the basis of measurement.

Institutionalizing Man's Infinite Capacity

How can we institutionalize the process of produc-

"Physical scientists want to put numbers on everything they measure . . . but we must remember that man himself has the ability to make measurements for which no instrument has yet been devised . . ."

ing standards which address themselves to such man-centered needs? There is little evidence to indicate that existing institutions or organizations can turn in new directions. Existing standards organizations and the associated research institutions, for example, have been addressing the problem of standards in terms of physical measurement and engineering properties for so long that their vision is fully shielded from man's true needs as a user. There is little evidence in history to give us hope for a change. Indeed, Max Planck said that "a new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it."

The same is apparently true of organizations and institutions. Ralph Nader says, "One of the most promising developments of the last two years is the growing belief that new institutions are needed within the government whose sole function would be to advocate consumer interests. . . . Most of the government agencies that are supposed to be concerned with the health and safety of consumers are also promoting the interests of the industries that cause the consumer harm."

I know from my own experience in Washington that the institutional paraphernalia of the scientific establishment is simply unprepared to cope with a basic conceptual shift. Advisory committees of the National Academy of Sciences recommend to scientifically based organizations such as the National Bureau of Standards that they stay out of areas involving human evaluation because these problems are outside of their "mission" and because good scientific measurement of them is impossible. Of course it isn't! You don't measure the flavor of apples with a micrometer.

In point of fact, measurement of human need and response is not impossible. The flavor of apples is measured—but not with a micrometer; and indeed micrometers are part of the hang-up. Physical scientists want to put numbers on everything they

measure, which for the most part are related to our eyes; but we must remember that man himself has the ability to make measurements for which no instrument has yet been devised: Expert humans can visually identify paintings as to their date, school, and artist. Expert humans can identify a musical composition by listening to the theme, and they can often identify the conductor, the orchestra, and the solo performer. Anyone can recognize famous people from good caricatures. Expert humans can identify wine by taste, including the vineyard from which it comes and the year of the harvest. Expert humans can differentiate between thousands of fragrances by smelling. Blind people can learn to read through touch and to sense space by sound.

What an infinite capacity the human has to be a part of the process of measurement, and how little our standards attempt to use this ability!

It is interesting to realize that we do not attempt to instrumentalize the process of justice; we have institutionalized processes which require knowledgeable and wise men as judges and citizens as juries. These institutions, combined with a concept of laws which are not fixed but evolving, come closer to a model for man-centered standards institutions than any other that occurs to me.

The formation of the institutional framework for man-centered standards will not be easy, nor can it be done quickly. But some positive steps can be taken. We must agree on and implement a series of social accounts for the nation; the report issued towards the end of the Johnson administration entitled *Towards a Social Report* provides an important move in this direction, which now must have real budget support. We must undertake research programs to expand the badly deficient body of knowledge needed to provide an intellectual base for man-centered measurements. The National Science Foundation is not likely to be an appropriate instrument; some new agency such as the proposed Foundation for the Social Sciences or a Department of Consumer Affairs should be formed and

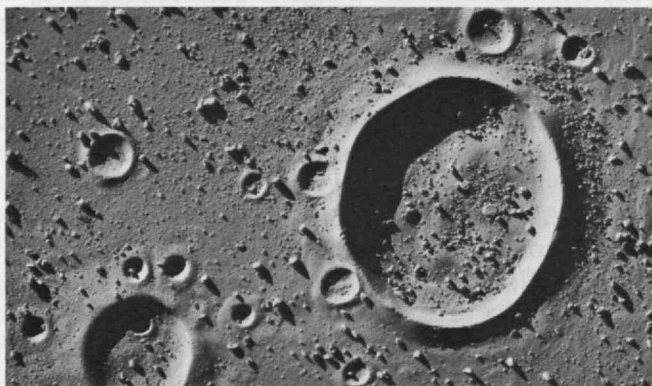
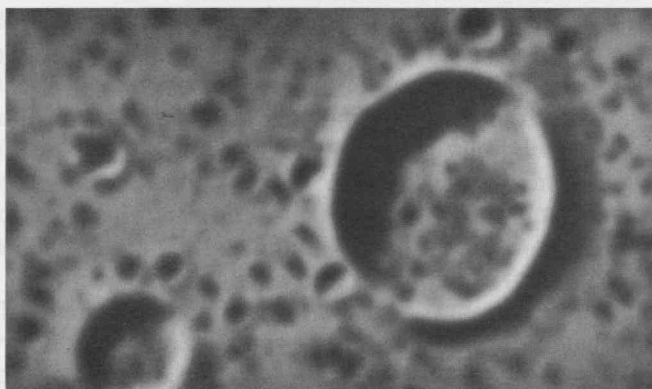
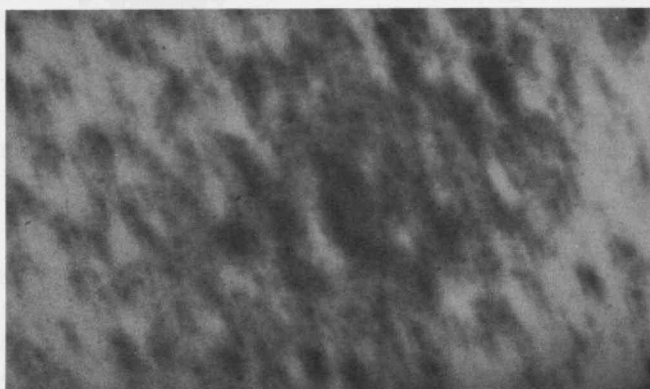
Lunar Photography for Apollo

given an appropriation by Congress for this purpose. A national body like the National Academy of Sciences should be established by the social scientists, urban planners, architects, and others interested in the man-centered paradigms. Academic institutions should formulate new programs to educate a new generation of professionals prepared to develop and utilize man-centered standards as their criteria of measurement. Pressure should be applied to federal, state, and local agencies to shift the basis of the decision structure so that these man-centered standards are recognized. This will be the most difficult strategy to implement, but it can have the largest direct impact. The important step taken by Lowell K. Bridwell, Federal Highway Administrator, in the last days of the Johnson Administration to require the consideration of affected people's interests in the design and location of highways shows that even an existing institution can be moved in this direction.

Lewis Mumford, in *Technics and Civilization*, states that "No society can escape the fact of change or evade the duty of selective accumulation." We have tended to fill our lives within urban places with pettiness and shallow value. We have tended to measure the effectiveness of our selective accumulation of urban artifacts in terms of their economy (with overtones of cheapness) and ease to a few while placing undue burdens and hardships on the many. We need to stop now—today and not tomorrow. We must stop not simply because we want to improve the performance of the things of our lives for all of us who are now living, but because we are creating a heritage for our children and their children's children. That later point in time which is theirs can be, rather than a burden, a blessing which flowed from the wise use of our affluence.

Just one year ago John P. Eberhard became first Dean of the School of Architecture and Environmental Design at the State University of New York at Buffalo, saying of the new School's direction that "environmental design should be the infusion of our technological processes with a sense of man's individual and social needs, . . ." Dean Eberhard studied architecture at the University of Illinois and subsequently practiced in Urbana; five years later his concern for the role of design in an industrialized building industry prompted his interest in an Alfred P. Sloan Fellowship for study at the M.I.T. Sloan School of Management (S.M.'58). Most recently (1964 to 1968) he was Deputy Director and later Director of the Institute for Applied Technology of the National Bureau of Standards.

The Mt. Wilson picture of Mare Imbrium is representative of the best obtainable from the earth. However, the 60X enlargement shows that a half-mile crater is merely a clump of grain. On a laboratory model, successive views show the detail within a simulated half-mile crater as resolution improves to 250, 25, and finally to 2.5 feet.



Increasingly satisfactory pictorial images of the moon which have paved the way for the Apollo landing represent a new level of electronic and photographic technology

George T. Keene
Apparatus Division, Eastman Kodak Company

Lunar Photography for Apollo

Even with our system of expressways it is wiser to travel with good maps. In the Apollo moon mission the National Aeronautics and Space Administration have taken this approach, mapping the lunar surface through the Ranger, Surveyor and Lunar Orbiter programs. The Ranger and Surveyor programs were directed for N.A.S.A. by the Jet Propulsion Laboratories of the California Institute of Technology. N.A.S.A.'s Langley Research Center managed the Lunar Orbiter project. In this article these photographic projects will be discussed in some detail, with emphasis on the resolution and coverage obtained by the Lunar Orbiters.

Resolution—Earth and Moon

For a safe landing on the moon we need maps revealing the size and location of craters, rocks, and other surface hazards. The quality required in these mapping photographs is demonstrated in a series of views showing the moon and a lunar model. The first picture in the series is representative of the best lunar photography taken from Earth. It has a limiting resolution of about one-half mile, but the 60-times enlargement in the second picture shows the half-mile crater as a smudge in the grain pattern. Using a laboratory model, a half-mile crater is simulated in the next three photographs at successively improved resolutions that finally show detail as small as two and a half feet. This model does not realistically simulate the lunar surface, but the final picture showing objects as small as two and a half feet in diameter is typical of the image quality required for the Apollo maps. The Lunar Orbiter flights covered more than 13,000 square miles of the lunar surface with a resolution about equal to that shown in the last picture.

To relate lunar scenery to more familiar pictures of Earth, the second series (on the following page) shows views of the Washington, D.C., area, the first picture covering an area 10 by 15 miles. The surface resolution of 50 feet appears adequate until the National Airport area is enlarged in an effort to learn the true nature of the mottled landscape along the Potomac River. At this resolution even buildings

are difficult to see, and it is not until we have a resolution of 13 feet, or better yet three feet, that we can clearly identify cars, airplanes, and other man-made objects. This last picture, while very sharp, covers only a few thousand square feet. To select and then verify landing areas for Apollo requires photography of this quality covering thousands of square miles.

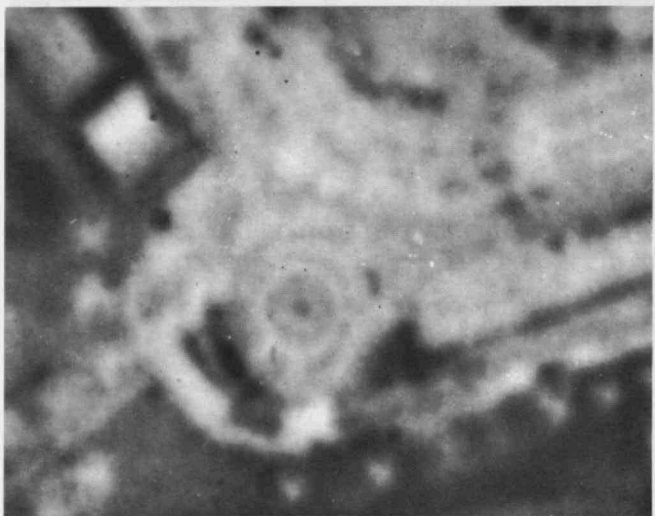
Let's look now at the N.A.S.A. programs designed to provide lunar photographic information.

The Ranger Series

Each Ranger vehicle carried six vidicon television cameras to the moon on a simple ballistic trajectory that made it crash into the surface at high speed. During the last few minutes before impact these cameras sent pictures of the rapidly approaching lunar surface to Earth for recording and analysis. The first six flights in this program did not return photographs because of problems in the Atlas-Agena booster and in the payload itself. However, on July 31, 1964, Ranger VII sent to Earth 4,304 pictures before crashing into the moon near the crater Darney. During early 1965 Rangers VIII and IX each returned about 6,000 pictures.

Of the three missions, photography from Ranger IX was of the highest quality. This vehicle crashed into the crater Alphonsus, a feature some 125 miles in diameter near the south central part of the moon. The first of the three pictures on page 59 shows the full crater with a resolution only slightly better than that obtained with Earth-based telescopes. This quality and coverage is typical of thousands of the early pictures from each Ranger flight. The second closeup of the central peak has greatly improved detail but still shows no objects smaller than 300 feet, six times poorer than the quality in the first Washington, D.C., picture. It is only the last Ranger picture covering an area of 125 x 160 feet that has the two-foot resolution necessary for mapping and for detection of hazards on the surface.

Each Ranger camera had an exposure time of 0.002



Washington, D. C., is shown at 50-feet resolution in a mosaic view covering 10 by 15 miles. Man-made details are uncertain in the enlarged view of the National Airport, but airplanes are seen and cars barely detected at 13-feet resolution. The final picture shows the 3-feet resolution achieved by Lunar Orbiter in hundreds of lunar scenes.





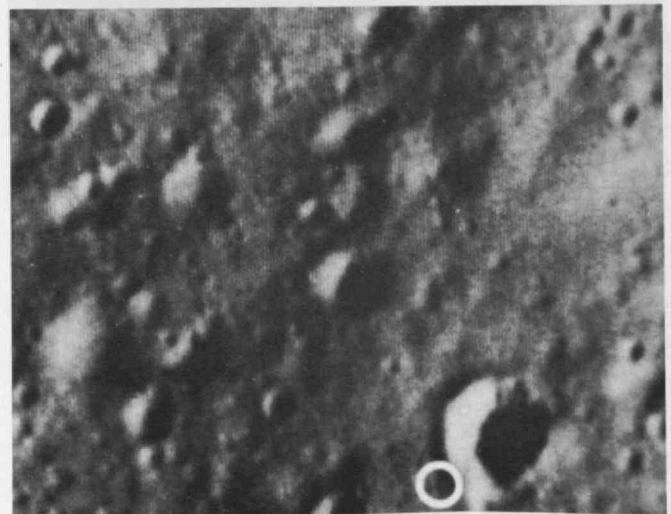
or 0.005 second, and each returned a picture to Earth in a cycle time of either 0.8 or 2.6 seconds. Despite this rapid operation, the velocity of 2.6 kilometers per second at impact causes appreciable blur in the last, most important pictures because no image motion compensation was used in these cameras. The final pictures from Ranger VII and Ranger IX did show with adequate resolution a small area of the moon, but we may not desire or be able to land exactly in that spot. Alternative landing sites must be found and mapped to give flexibility to the Apollo launch date selection and the landing operations.

Although the Ranger data were limited, these pictures did give needed information regarding the size, shape, and distribution of lunar craters. These early views were an aid in making more accurate models of the surface, but they were not useful for mapping at a resolution adequate to support the Apollo landing.

Surveyor—The First Soft Landing

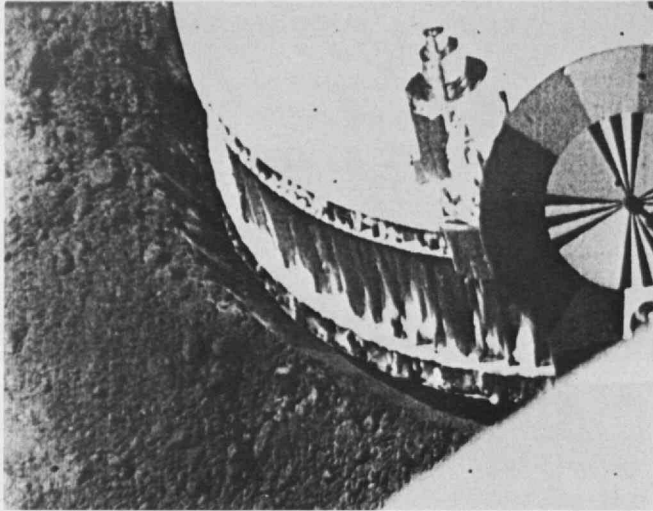
Because Surveyor carried the fuel necessary to provide a soft landing on the surface, it was launched with the more powerful Atlas-Centaur booster. Surveyors I, III, V, VI, and VII landed on the moon and sent valuable pictures to Earth concerning the strength and bearing characteristics of the surface. Like Ranger, Surveyor used vidicon television for close-up pictures of lunar rocks and soil.

During the period from June, 1966, to January,



The first view from Ranger 9 has a resolution only slightly better than that seen from Earth. The close-up of the central peak, taken at 58 miles altitude, still shows no details smaller than 300 feet. Before crashing near the white circle, Ranger 9 returned this final view revealing craters as small as two feet in size over a small area.

After a gentle landing on the Moon, Surveyor I sent this view of one of its foot-pads in which particles of material only 0.5 mm. in size can be seen. Note the mark left as the foot-pad slices through the cohesive lunar soil.



1968, the Surveyors were landed gently on the surface at a velocity of about 10 feet per second. On command from the Earth, these vehicles scratched, probed, analyzed, and photographed their immediate surroundings. The data from Surveyor VII was particularly exciting because it landed in the rugged terrain near the crater Tycho. Analysis by alpha-particle scattering showed lower iron content in this region compared to the darker maria in which other Surveyors came to rest. Other experiments included magnetic analysis of the soil and a trench digger to study the strength and cohesiveness of the lunar surface.

Basic to all Surveyor experiments was the vidicon camera. It carried a lens that could zoom from 25 to 100 mm. focal length and was equipped to focus as closely as 1.2 meters and with an aperture range from $f/4$ to $f/22$. The field of view varied from 6.4° to 25.3° and could be scanned 360° by a panning mirror that also moved from $+31^\circ$ to -67° in altitude. Transmitted pictures exposed successively through orange, green, and blue filters could be superimposed on Earth to provide a color view of the surface. Vidicon pictures could contain either 200 lines or 600 lines. In the later mode, the cycle time for sending a picture to Earth was 3.6 seconds.

While each Surveyor mission returned about 10,000 pictures, all were taken in one area and very nearly from the same vantage point on each flight. Later Surveyors did lift off the moon and move by rocket power for a few feet across the surface. This exercise made possible stereo photographs of nearby objects and allowed the camera to see the effect of the rocket-jets and foot-pads in disturbing the lunar soil. Resolution is about one-half millimeter near the foot-pads but drops off rapidly as the camera views toward the horizon. Coverage is limited to the area around the vehicle as seen from a vantage point only six feet above the surface. Because of the narrow view of this camera, hundreds of pictures must be mosaicked together to provide a panoramic view of the horizon, while many others must be carefully fitted together to obtain maximum resolution over an appreciable area near the vehicle.

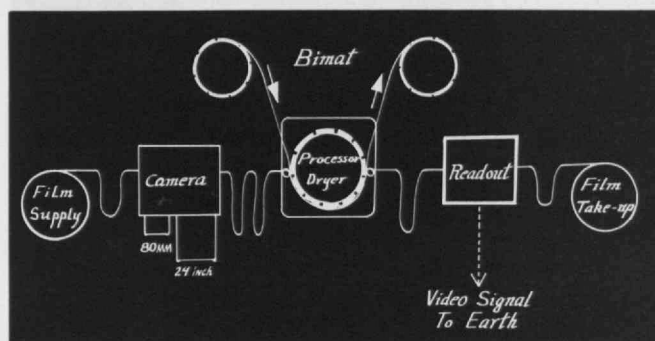
Surveyor's most important contributions were to verify a landing technique and to confirm that machines and men could land and move over the lunar surface. However, the Apollo mapping program required "a long-playing Ranger" which would give simultaneously both high resolution and wide coverage. These qualities were provided by the stable platform and very high resolution of the film system carried by the Lunar Orbiter. Here was a method for rapidly acquiring huge quantities of picture data without the need for intermediate magnetic tape storage.

The Lunar Orbiter

For this program N.A.S.A. chose the Boeing Company as prime contractor to direct the project and to provide the propulsion, guidance, and electrical systems; R.C.A. supplied the antenna and communications devices, while the Eastman Kodak Company provided the 145 pound, pressurized photographic system and the photographic ground reconstruction system.

Working under severe weight constraints, the Kodak designers built a payload which could be

In the Lunar Orbiter camera system, simultaneous pictures are taken on Kodak aerial film using lenses of 24-inch and 80-mm. focal length. After processing with the moist Bimat film, the dried negative is scanned by a 5-micron spot of light and the video signal sent to earth for reassembly of the photographs.

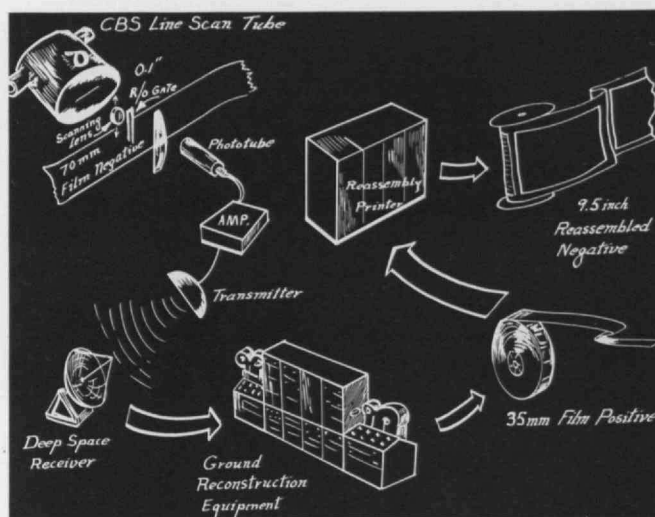


boosted by the Atlas-Agena on a three-day flight path to the moon. Rocket retrofire slowed the vehicle into a temporary orbit about 925 kilometers above the lunar equator. After several orbits during which this trajectory was carefully checked, a second rocket firing dropped the vehicle into an elliptical path passing only 46 kilometers (about 28 miles) above the lunar surface on the side facing the Earth. The cameras were versatile enough to allow photography from 1500 miles to as close as 27 miles above the moon. This close approach and the sophisticated camera system on Lunar Orbiter made its pictures substantially sharper than those taken by either the Apollo crewmen in December, 1968, or the earlier television vehicles.

The orbiter carried two f/5.6 lenses of 24 inches and 80 mm. focal length. Shutters of 0.04, 0.02, or 0.01 second exposed the images onto 70-mm. fine-grained aerial film. After exposure the film was processed by a special moist web called Kodak Bimat Transfer film. Following a drying stage the film moved to a readout gate where, in strips 1/10 inch wide running across the film, the images were scanned by a spot of light only 0.0002 inch in diameter. A photomultiplier recorded the varying transmission of light through the film. After amplification, this analog video signal was transmitted to the three Deep Space receiving antennas at Woomera, Australia, Madrid, Spain, and Goldstone, California.

On Earth the images were recorded on 35-mm. film as a 7.2 times enlargement of the 1/10-inch strip of

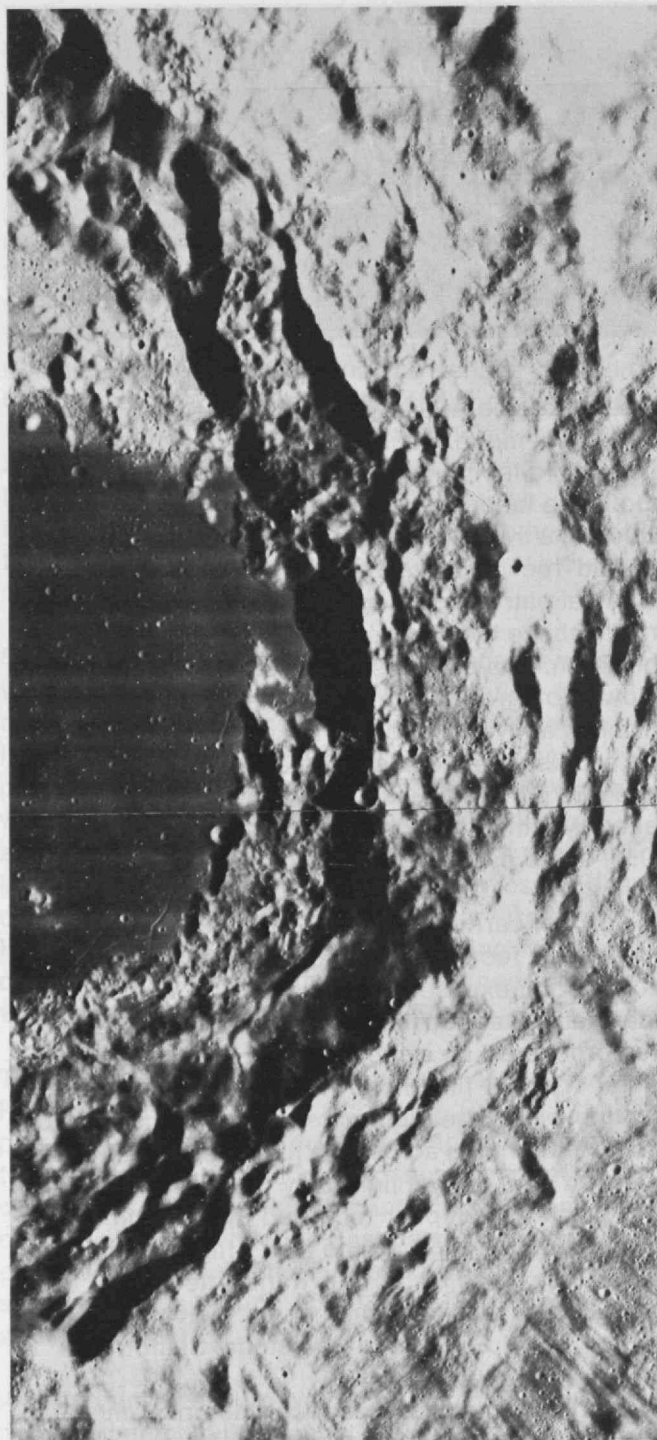
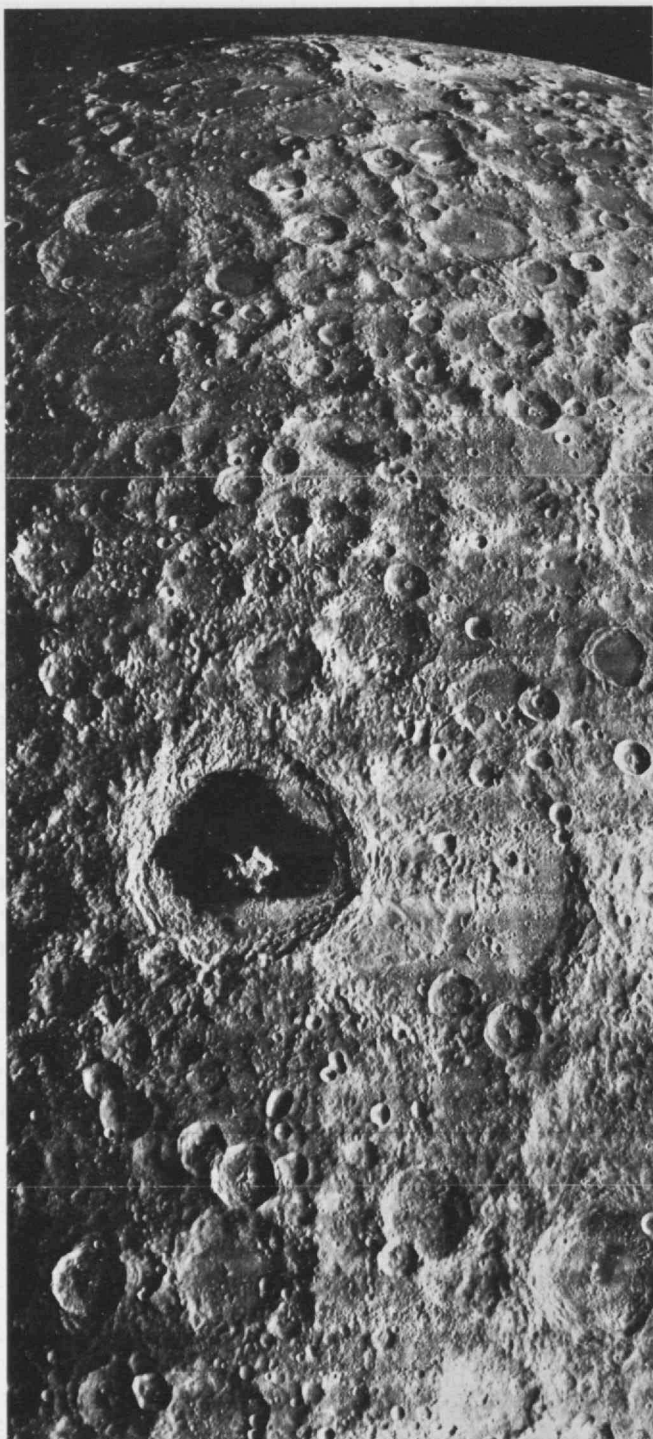
During readout the spot of light moves 18,000 times across the 0.1-inch strip of film in 21 seconds. The film advances to reveal the next 0.1-inch area, and the scan is repeated until all 220 feet of 70-mm. film have been covered. In the Ground Reconstruction Equipment, a 7.2-times-enlarged image is made on 35-mm. film; these strips are later reassembled on 9½-inch aerial film to recreate a six-times enlargement of the original picture.



vehicle film. After processing at the receiving site these films were flown to Rochester for reassembly at Kodak. In the reassembly printer 14 adjacent 35-mm. strips were imaged in careful registration onto lengths of 9½-inch aerial film. After processing, these wide segments could be further assembled to rebuild the image from a complete spacecraft frame. Copies of these 9½-inch-wide records and several million feet of 35-mm. film were printed by Kodak for distribution to the N.A.S.A. centers for mapping and for detailed study.

A basic advantage of a film system over television is the ability to rapidly acquire and store extremely sharp images over wide fields of view. Resolution on Lunar Orbiter pictures received on the Earth approached 100 line pairs per millimeter measured with a low-contrast target. By comparison, vidicon tubes for space systems are limited to a resolution of about 20 line pairs per millimeter when measured in the same manner. To obtain this sharp image both orbiter lenses used image motion compensation, a method of eliminating the blur that would otherwise be caused by the vehicle motion of a half mile per second. Even from 30 miles altitude this orbital velocity blurs the image in the same way that details along the highway are smeared in a picture taken from a moving automobile. Lunar Orbiter car-

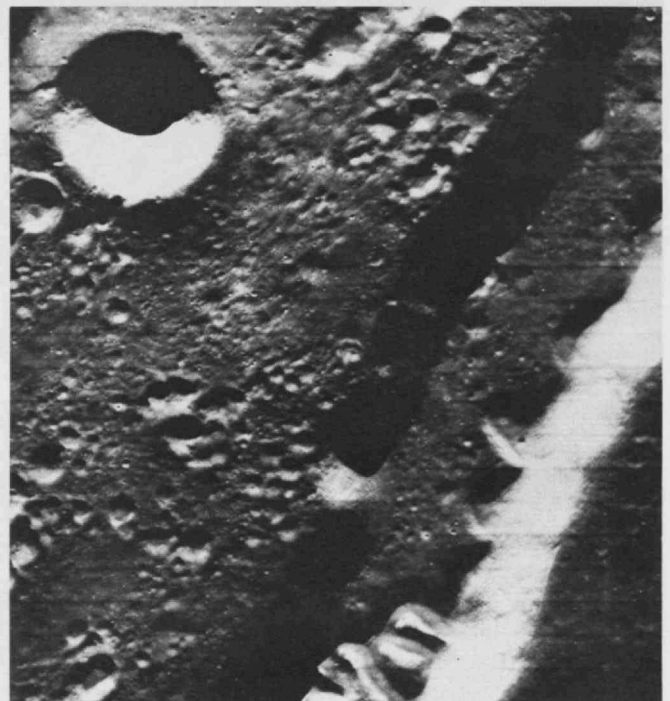
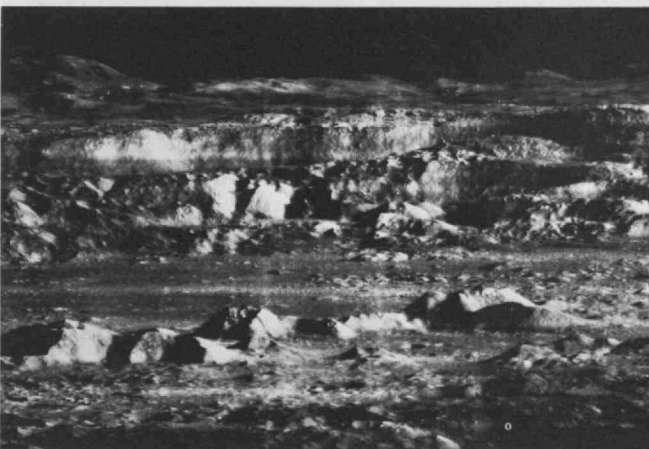
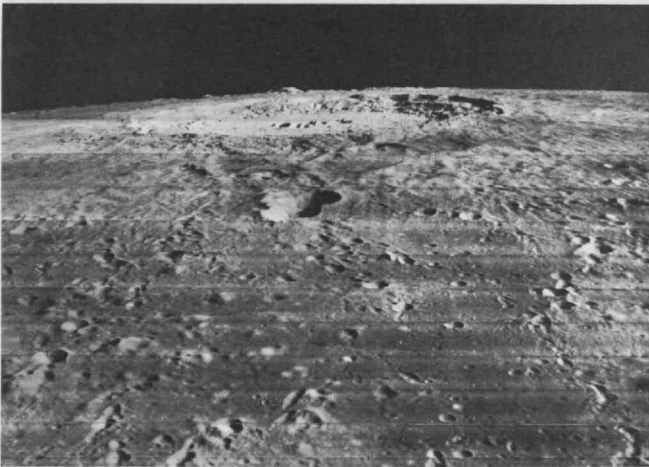
From 1460 kilometers above the back side of the moon, Lunar Orbiter III returned these views of the region near Tsiolkovsky. About one-quarter of the telephoto view is shown; this camera images with a 24-inch lens an elongated area centered in the frame taken with the 80-mm. lens. Tsiolkovsky is about 150 miles in diameter.



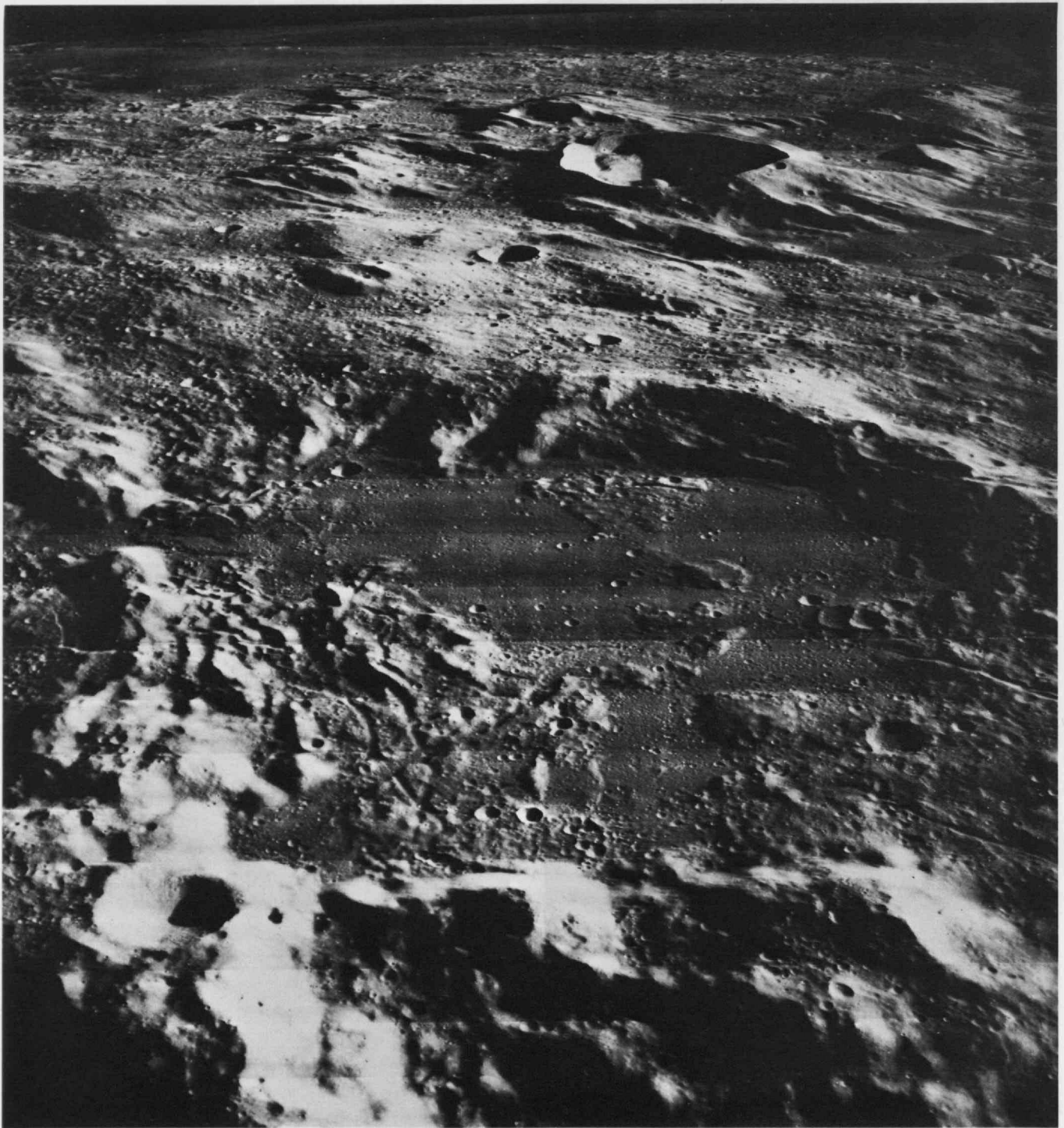


In the view taken from Earth at Yerkes Observatory, the keyhole-shaped crater Fauth is shown below Copernicus, an impact feature about 60 miles in diameter. The adjacent pictures were taken by Lunar Orbiter II from a point 28.4 miles above the surface and 150 miles south of Copernicus. The central mountains are 1000 to 3000 feet high, while the distant crater walls rise 11,000 feet above the crater floor.

The wide-angle picture from Lunar Orbiter V shows a "river" in Schroter's valley, a sinuous rille one to four miles wide and 120 miles long. The simultaneous telephoto view, also taken from 80 miles altitude, reveals an "ox-bow lake" formed by the meandering fluid.



Murchison is the ruined crater in the foreground in this wide angle view taken by Lunar Orbiter III from an altitude of 30 miles. In the hills about 50 miles away is the crater Ukert, 12 miles in diameter and with a rounded central peak. Near the valley connecting Murchison to Pallas at the left is a region in which forces from below have apparently fractured the surface.



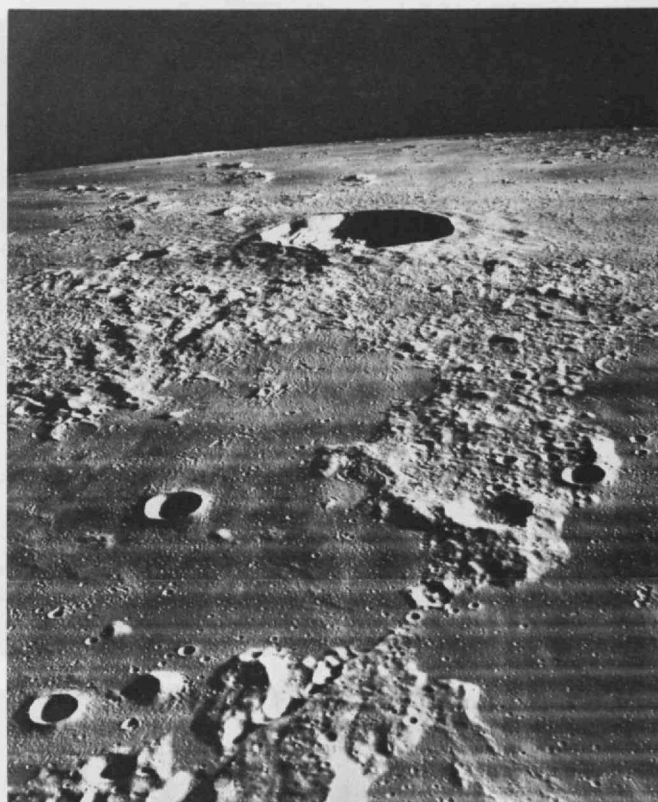
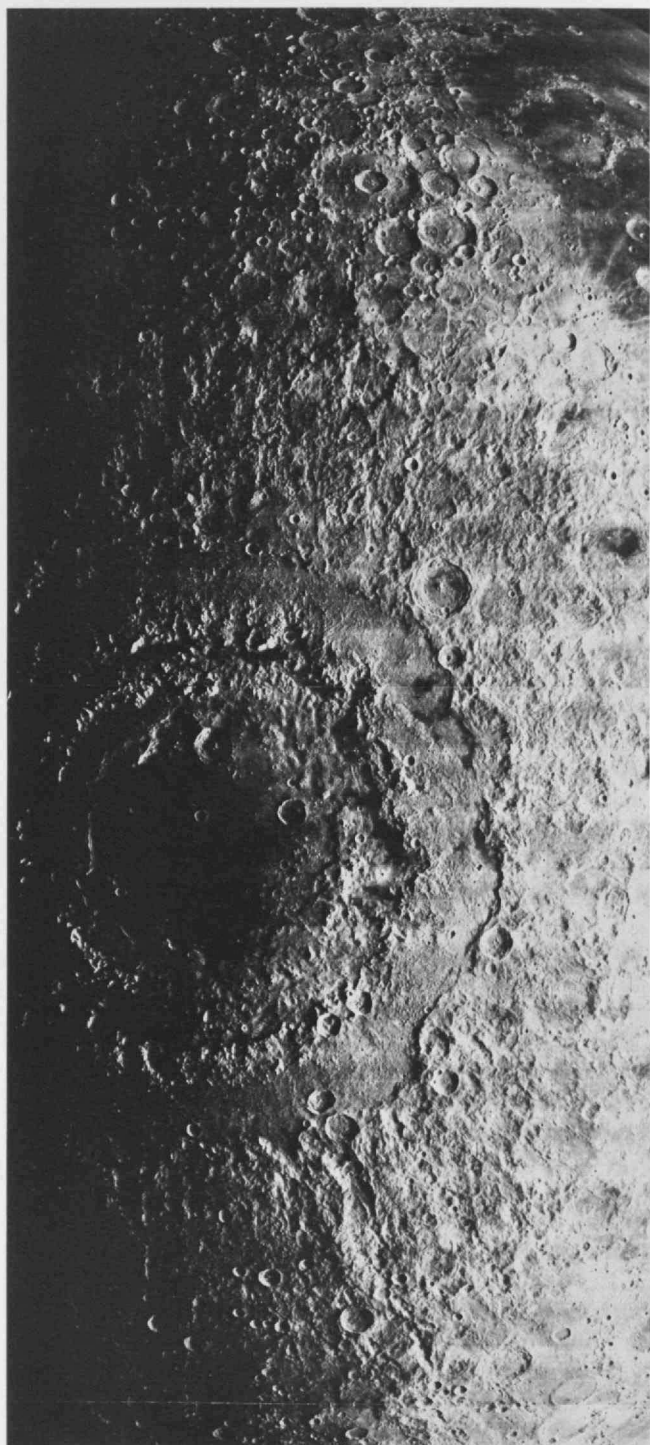
From Earth we see only the right-hand half of this scene showing Mare Orientale as photographed by the 80-mm. lens from 1,700 miles altitude. Lunar Orbiter IV discovered this feature, an impact scar spanning 600 miles. The Cordillera Mountains, 20,000 feet high, rim this bull's-eye which is covered with a pattern of cracks and coarse debris.



The 80-mm. lens on Lunar Orbiter III took this picture of Kepler, a crater about 20 miles in diameter and 7,500 feet deep. The vehicle was 36 miles above the moon and 80 miles from the crater when the picture was made. Kepler appears to be a relatively new impact feature and is the center of a system of bright rays caused by ejected material.

Tycho is 54 miles across and has walls rising 14,000 feet above the crater floor. This wide-angle view was taken from 120 miles altitude by Lunar Orbiter V. Solidified lava beds are seen as gray areas just outside the rim of Tycho that is towards the sun. Material exploded from the crater furrows the adjacent hills, some appearing as bright rays stretching for 2,000 miles across the moon.

AS A RESULT OF A CRASH LANDING ON THE MOON, THE LUNAR ORBITER VEHICLE WAS DESTROYED. THE CRATER KEPLER, WHICH WAS THE CENTER OF A SYSTEM OF BRIGHT RAYS CAUSED BY EJECTED MATERIAL, IS THE CENTER OF A SYSTEM OF BRIGHT RAYS STRETCHING FOR 2,000 MILES ACROSS THE MOON.



The craters Messier and Pickering are shown in these views from Lunar Orbiter V exposed from a height of 60 miles. Messier is a rare elliptical crater about 5 by 9 miles in size; it probably was caused by a grazing meteor impact. Faint, swallow-tail light streaks extend beyond Pickering, possibly from debris trailing over the surface after this unusual collision. Two peculiar, dark streaks cover the bottom of crater Messier.

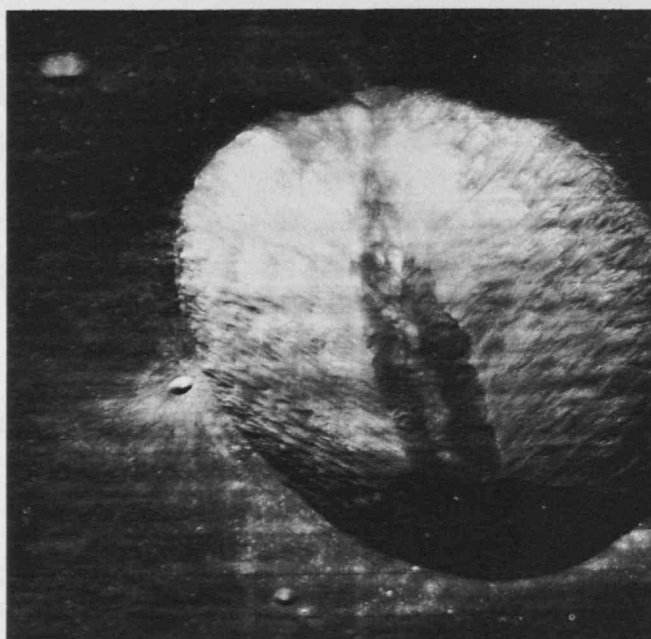


ried mechanisms to sense this motion, clamp the film, and move it to exactly match the image velocity. During this interval, shutters on both cameras open simultaneously to record the wide angle and telephoto views.

Since the film cannot be recovered, the readout system must preserve this resolution in the primary image available on the Earth. To do this, a line of light formed by a line-scan tube is reduced through a moving lens such that 18,000 lines are scanned across the 70-mm. film while the beam traverses the 0.1 inch interval. After transmission to Earth the signal appears as a similar line of light on a cathode ray tube which is photographed to yield the 35-mm. primary record. Lunar Orbiter used current technology that was designed to provide qualitative picture information. While not of cartographic quality, its photographs do form a reasonable basis for mapping the Apollo landing sites.



All five Lunar Orbiter missions returned useful pictures, and the first three completed the basic job of mapping potential landing sites near the lunar equator. Each mission returned over 200 pairs of pictures, far less than the thousands sent by each Ranger or Surveyor. However, each picture contained many more bits of information and much less redundancy than those taken by the television systems. With the basic mission accomplished, N.A.S.A. used Flight IV to map from polar orbit the complete front side of the moon and most of the back side at a resolution of 50 meters. This front-side map, made with the 24-inch lens, can be arranged into a detailed view of the front of the moon about 40 feet in diameter. Flight V was also placed in a polar orbit and from 60 miles above the surface mapped over 200 lunar areas of particular interest to astronomers and geologists.

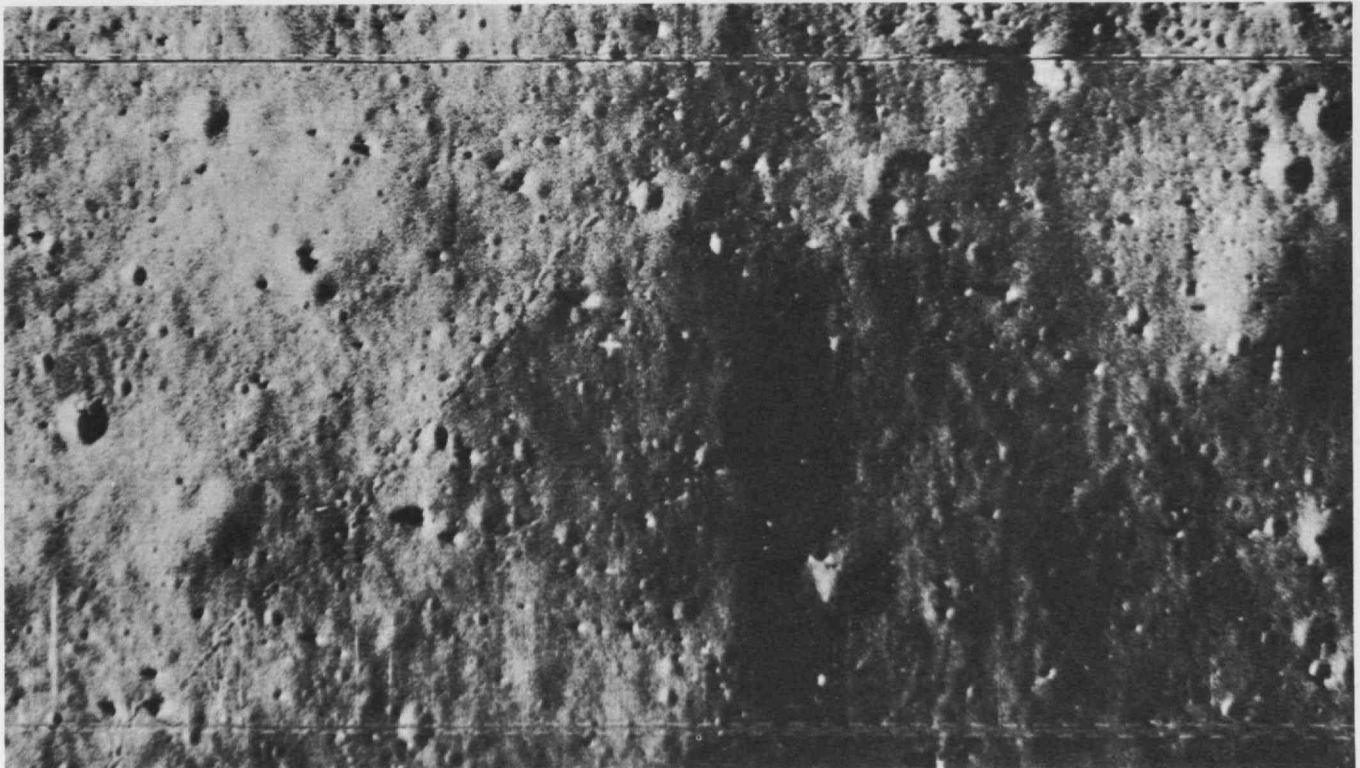
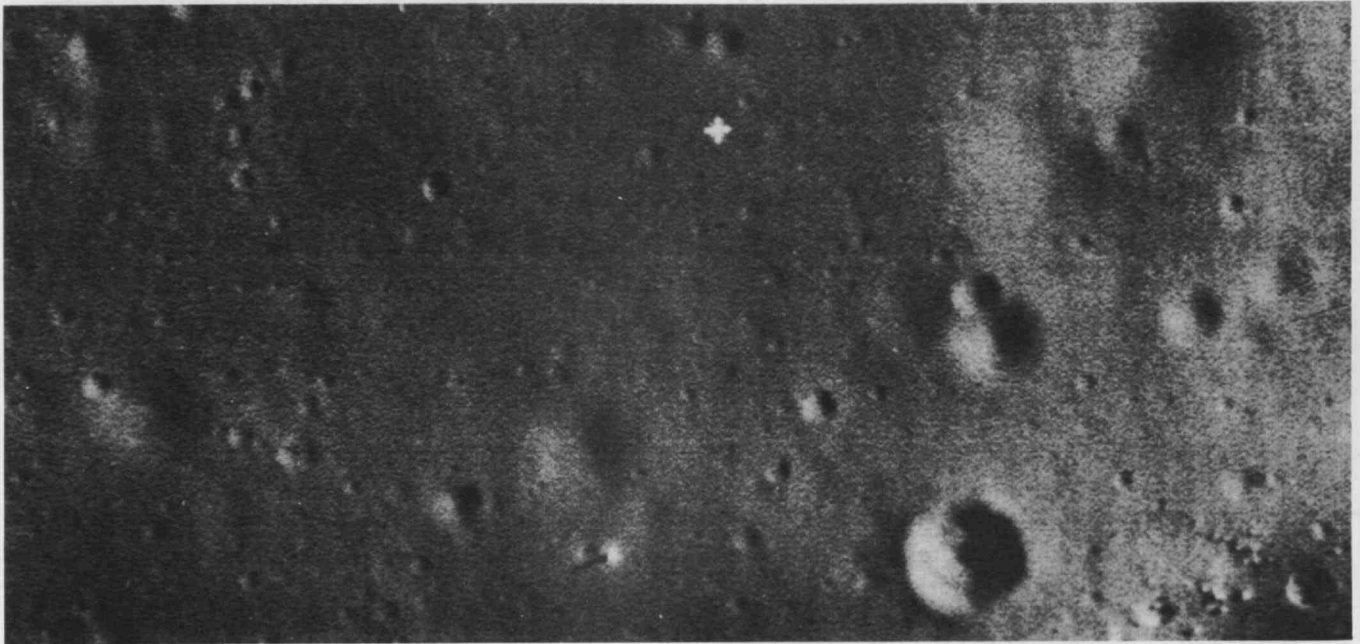


The accompanying pictures show only a tiny fraction of the output from Lunar Orbiter. Sharpness is lost in any reproduction, but even these enlargements cannot be reproduced by half-tone screen in the magazine without a substantial loss in quality.

These enlargements from pictures made with the 24-inch lens reveal the high resolution of Lunar Orbiter photography; about 600 feet on the moon are covered between the dotted lines bordering each framelet.

In the upper view, the Surveyor I spacecraft is shown as a white object casting a 30-foot shadow. It rests on the surface west of a prominent 80-foot crater that is shown in pictures returned by the Surveyor television camera. White cross marks are reference points exposed by Kodak on the film prior to the flight.

The lower picture was taken from 30 miles by Lunar Orbiter II. It shows the 1,300-foot path left by an 11-foot boulder as it rolled down a shallow crater wall. From its shadow, the boulder appears more rounded than others; this feature may have helped in making it move while its companions remained fixed.



Smaller pictures show the wide views obtained by the orbiter but at a great loss in resolution.

The pictures of Tsiolkovsky include all of the wide-angle view and about one-quarter of the telephoto photograph. These scenes demonstrate the manner in which the two cameras supplement each other and aid in locating lunar features. In another example, the views of Copernicus are compared to a good photograph taken from the Earth. In this case the high oblique view is shown to be a valuable supplement to the usual vertical picture taken for making maps.

The craters Murchison and Pallas are near the center of the lunar hemisphere that faces Earth. The floor of Murchison contains an interesting feature, apparently caused by the pressure from below of a plug of lava or ice. The surface is fractured and up-thrust in a manner often seen in frozen tundra and around volcanic fields on Earth.

Because astronomers have seen reddish gases near the crater Aristarchus, this region and the adjacent Schroter's valley is of particular interest. This valley runs in a sinuous path for about 120 miles and is from one to four miles wide. It was photographed by many of the Orbiters at several scales, and the 80-mm. picture from Flight V vividly shows for the first time the meandering river in the valley floor. The "ox-bow lake" photographed simultaneously by the 24-inch camera appears to have been caused by fluid flow. The river shows no evidence of a solidified final lava flow, and we do not know whether these meanders were formed by water or by a fluidized gas-dust mixture. While the pictures furnish interesting evidence, we need surface exploration in this puzzling region to learn the true nature of the "Schroter river."

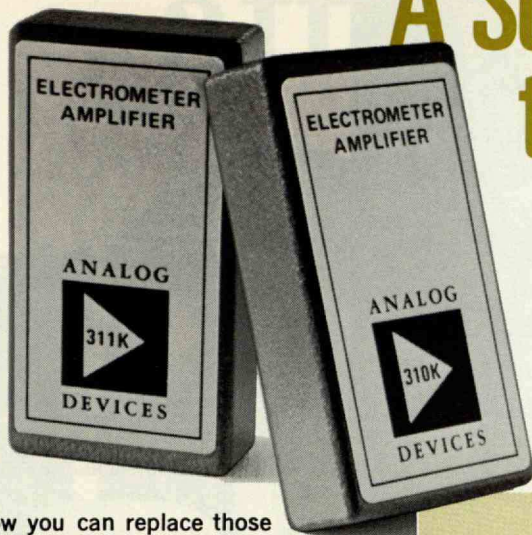
Maps for the Future

The close-up view of Surveyor I shows how little we learn about a 12-foot object when the resolution of the camera system is three feet. Despite an apparent need for sharper pictures, N.A.S.A. now has

no funded program for advanced lunar mapping. Studies are in progress for missions beyond Apollo, including surface traverses which certainly would depend on improved maps for their successful completion.

Although working with a shrinking budget, N.A.S.A. plans Mariner vehicles carrying television on fly-by missions to Mars in 1969, and in two orbiting vehicles in 1971. In 1973 spacecraft will be sent to Mars to obtain more television pictures and to place a lander of minimum weight on the surface. So far there are no plans to again use a film system, but just as Apollo needed the Lunar Orbiter maps so will future planetary landings need the high resolution and data storage capacity of a film reconnaissance system. These pictures document our progress in space and pave the way for the landing of machines and eventually for men.

George T. Keene, who received M.I.T.'s Master of Science in the Department of Chemical Engineering in 1952, is in charge of the Photographic Science Group in the Apparatus Division of Eastman Kodak Company. Under his direction the Group assisted in the design and testing of photographic systems aboard the five Lunar Orbiter vehicles and was responsible for the reassembly of pictures transmitted to the earth and for the production of over 5 million feet of 35-mm. duplicates of these images.



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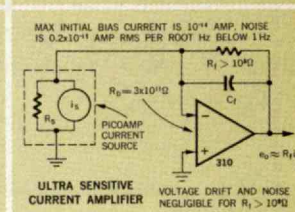
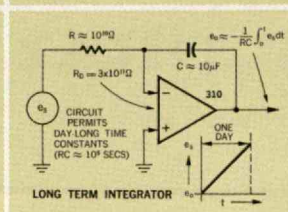
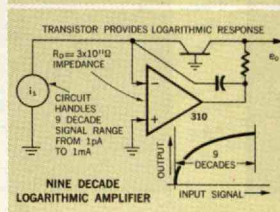
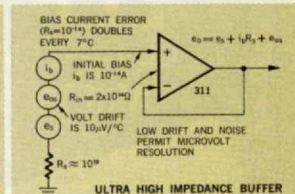
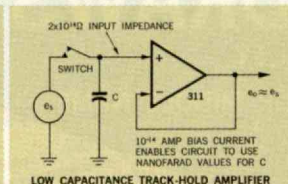
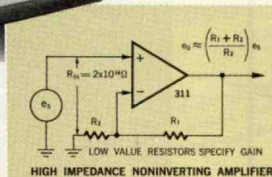
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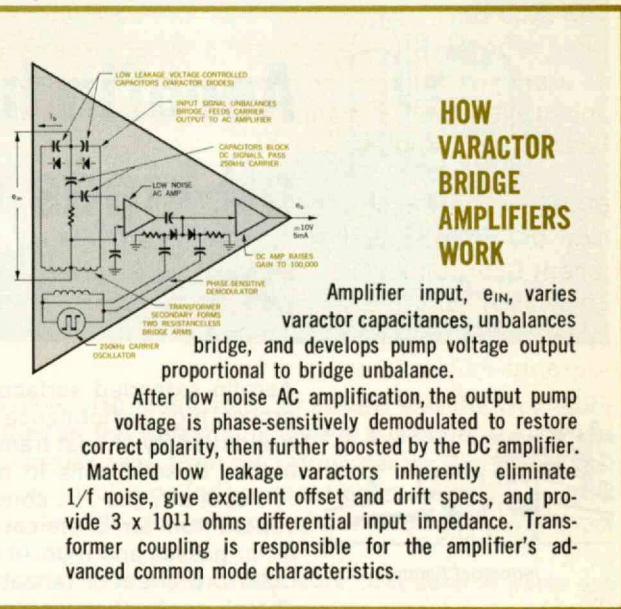
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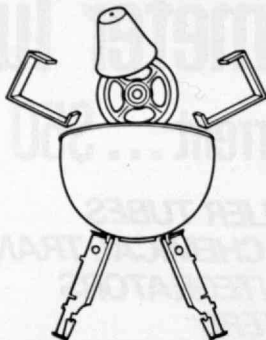
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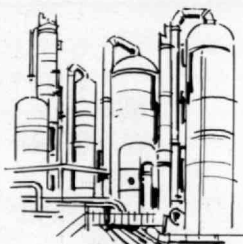
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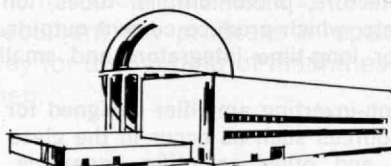
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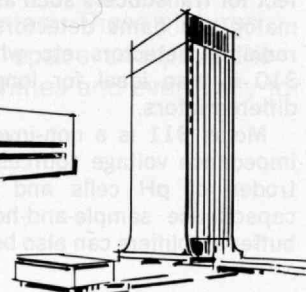


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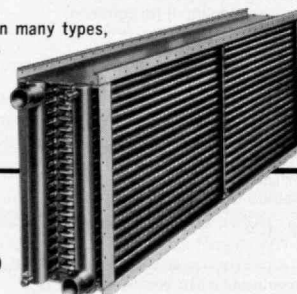
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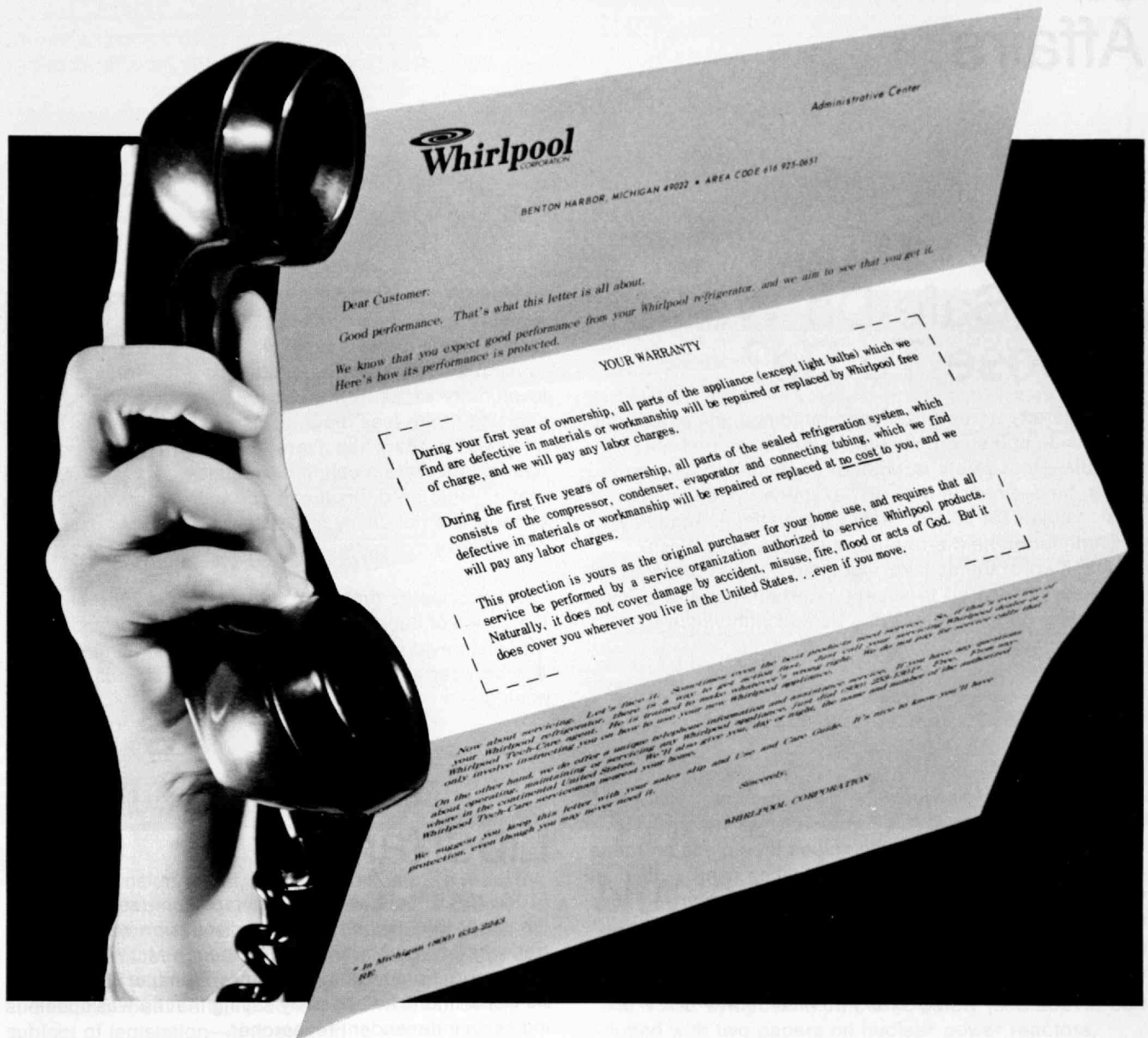
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The consumer also finds that we make it easy to get in touch with us—day or night—if she needs information or assistance. If the owner has a question about operating, maintaining or servicing any Whirlpool appliance, she can call our 24-hour "cool line" phone number pasted on the back of the product. There is no charge for the call anywhere in the U.S.

If service is needed, we try to assure the best through a network of franchised service centers. These TECH-CARE centers must maintain rigid standards of training and performance for annual renewal of their franchise.

We have also taken steps to assure that the free labor specified in the warranty is always available, even if the owner moves away from the selling dealer. The owner can go to any dealer or independent agent, who will receive his regular rates for performing warranty labor. Whirlpool pays for it.

We go a long way to make sure that service parts are available, too. We keep each functional part on hand for at least 15 years . . . and beyond that until a year goes by without a single call for it. Maybe that sounds like an unusually long stretch, but our products are built to stay on the scene a long time after the sale.


Whirlpool
CORPORATION

P.S. For more information about any of the after-the-sale services mentioned here, just call our customer "cool line". The number, if you're in Michigan, is 800-632-2243. Outside the State, the number is 800-253-1301. Our dime.

Trend of Affairs

How Safe Do We Choose To Be?

It is generally agreed that cars, buildings, manufacturing processes, and so on, should be made safer where possible—that safety is, without qualification, a condition to be desired. In May, to “examine the engineer’s responsibility for public safety,” the National Academy of Engineering held a one-day symposium in Washington. Two of the speakers pointed out that, in fact, people are prepared to accept a certain measure of risk, depending on the value of the benefit with which the risk is associated.

One of these speakers, frequently quoted by subsequent contributors, was Chauncey Starr of the University of California, (Los Angeles) School of Engineering and Applied Science. Dr. Starr proposes some rough quantitative relationships between the risks of death to which people expose themselves—in driving, smoking, flying, mining, waging war—and the values they place on these activities, measured in dollars. Activities can be divided into two classes, voluntary and involuntary—either the individual chooses whether or not to take part (e.g. hunting) or the choice is in the hands of others, who act with the consent (in some form) of the whole class of people involved (e.g. power generation).

The dollar value of a voluntary activity is simply what the individual pays to engage in it; that of an involuntary activity is the contribution it makes to the average annual income. The value of electric power, for instance, was obtained from a United Nations study of the relation between energy consumption and national income in different countries.

Dr. Starr arrived at the following findings. First, people are prepared to expose themselves voluntarily to about a thousand times the danger that they will tolerate from the actions of others. Thus, voluntary and involuntary activities are two quite distinct classes. “We are loath to let others do unto us what we happily do to ourselves.”

Second, people very often choose to risk their lives to about the same extent they are already at risk from disease. The average risk of death from disease for the

whole U.S. population falls close to the “sporting” group of activities, “almost as though the individual’s subconscious computer adjusted his sporting courage to meet but not exceed the statistical mortality due to involuntary exposure.” An incongruous member of the sporting group (see diagram) is the Vietnam war, whose fatalities Dr. Starr has averaged over the whole population, as if it were a collective voluntary activity (we note that it would be difficult to treat as involuntary, since its benefits are not easily measurable, while its costs, of course, are).

Third, it appears that risks are roughly proportional to the cubes of benefits, within a given class of activities. The main evidence for this finding is a striking correlation between death rates and wages in various types of mining.

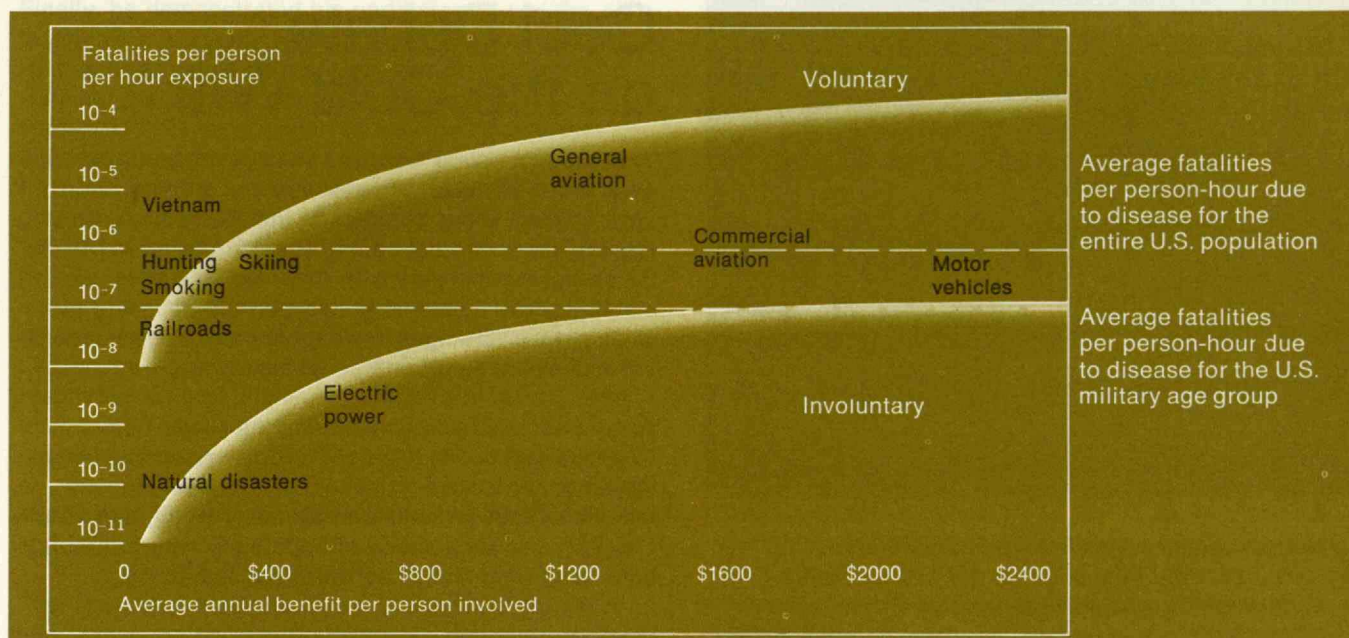
Driving: The Informed Libertarian

At the N.A.E. “public safety” symposium (see above), the paper that caused the most discussion was one on traffic safety, by Martin Wohl. Although Mr. Wohl is manager of Ford Motor Company’s Transportation Analysis Department, he began by saying that he was speaking as an independent researcher.

In practice, drivers place themselves at risk for the sake of the benefits they will obtain by so doing—sometimes to the extent of knowingly increasing their risks above the average level. Thus “the safety question” inevitably rests on a bargain. It is necessary to discover the benefits and the costs of a particular safety measure, and to decide who will benefit and who will pay. We must ensure that designers and public officials “do not purchase or require more safety for either the public at large or a certain segment of that population than is consistent with the value scales of the people.”

Safety measures may either benefit the driving public at large (like the redesign of highways) or may directly benefit the individuals who adopt them (like lap belts). The costs of these two classes of improvement should likewise fall, respectively, on the general public and on the individual.

Various sources of risk, on a plot of apparent benefit against risk of death (from a paper by Dr. Chauncey Starr—see facing page).



Mr. Wohl considers that, while the automotive industry, left to itself, would probably provide too little safety, "federal action will probably result in over-provision of safety." He illustrated this thesis by a lengthy study of the situation with regard to seat belts, side-marker lights, and alcohol. Seat belts, he considers, need not be the subject of legislation—it is enough to inform the individual and let him choose. Side-marker lights, on the other hand, contribute largely to the safety of "the other driver," and federal standards or subsidies could well be useful—but there is as yet an absence of the necessary cost/benefit information.

Alcohol falls in neither category, since the imposition of more restrictive laws in this matter, although presumably contributing to traffic safety, would also reduce the driver's pleasure and convenience (which are, after all, the primary reasons for driving). Again, real data on the effects of "drunken driving" laws is lacking, and Mr. Wohl strongly suspects that many legislators are merely expressing their moral prejudices.

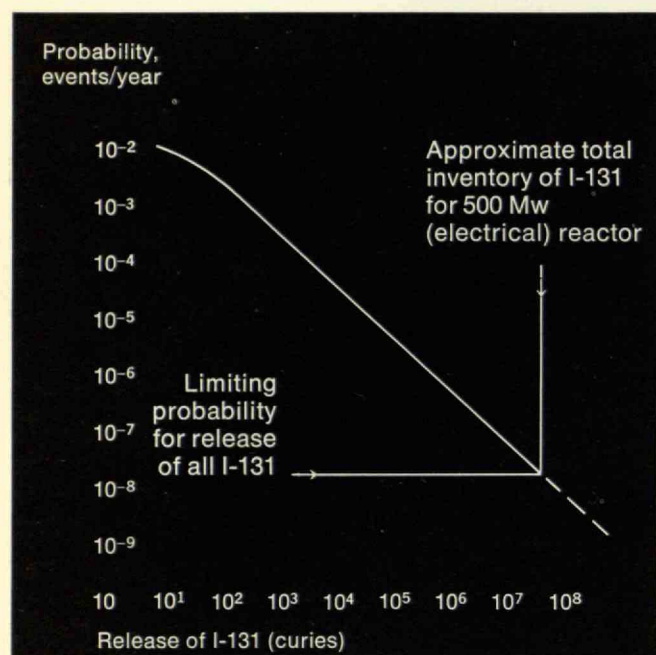
Nuclear Power: Reducing the Risk

The N.A.E. symposium on public safety (see above) concluded with two papers on nuclear power reactors, where failure could be extremely serious in its consequences but has been made so remotely unlikely that many regard it as now disposed of.

The nuclear power industry was not permitted to get started until a rational set of safety procedures had been established. James T. Ramey, Commissioner of the U.S. Atomic Energy Commission, quoted a recently appointed study group thus: "With existing techniques and knowledge, the total risks to the public from nuclear power plants, although very small, cannot now be meaningfully expressed numerically."

F. R. Farmer, head of the Safeguards Division of the United Kingdom Atomic Energy Authority, took a different view. The danger to the population from reactor accidents can be stated in terms of increased risk of various cancers. It is possible to state a relation between amount and type of fission products released and

The safety design criterion for a nuclear reactor could be specified as a "limit line," specifying the probability (per unit time) of the release of any given amount of some hazardous product (from a paper by F. R. Farmer of the U.K. Atomic Energy Authority).



number of cancer cases (above the general level) thereby induced. Thus, an objective can be stated, in the form of a graph such as the one shown, which specifies the maximum allowable annual probability of releasing any given amount of iodine-131 (or its equivalent) up to the total content of the reactor.

At the "small accident" end of this graph, involving barely detectable rises in cancer-incidence, it turns out that the public are well protected by the economic needs of the reactor operator—"any small to medium accident will cause substantial loss of revenue and repair charges, and if these occurred yearly, or even every few years, mostly without harm to people, the target at the low-release end of the scale might be set even tighter."

This says nothing about the actual or permissible risk of major accidents. If the requirement of this particular graph is translated into risks for semi-urban reactor sites (putting weather and population density into the calculation), Mr. Farmer finds that, for each reactor designed to this specification, there would be less than one in a million annual probability of inducing up to 10,000 cases of thyroid cancer. This seems a negligible risk, until we remember that present-day decisions in the United Kingdom will affect about 100 reactors operating during the next 30 years. The risk now proves to be around one in a thousand. At this point, said Mr. Farmer, a judgment must be made. Is this a desirable degree of risk, or should we modify the objective?

Given this judgement, the designer can set about meeting the reliability target it implies, specifying reliabilities for components. He will require more information on component reliability than is at present easily available, but the obstacles are human rather than technical. Mr. Farmer suggested a number of reasons why this approach is not already normal practice: "there has been inadequate conviction of urgent need; . . . what is being done is assumed to be good enough."

But the "target-first" attitude is gaining ground in the U.K.; the Atomic Energy Authority has now accepted the principle of deciding on a "graduated risk," and the practical procedures are being worked out.

Cool Debate on the Cold War

That thermonuclear weapons shall never be used is the central aim of those who plan and build them, said Dr. John Craven, Chief Scientist of the U. S. Navy's Strategic Systems Project Office, speaking to an M.I.T. discussion group this spring. In other words, one strives for stability in the relationship between the opposing nuclear powers; changes in weaponry are judged according as they are stabilizing or destabilizing.

Dr. Craven has been considering the properties of weapons systems in this light (properties such as striking range, openness to inspection, communications time-constants, for example) for many years, and he discourages the acceptance of apparently natural assumptions as to what kind of activities are stabilizing.

Would progressive disarmament provide an environment favorable to stability? Perhaps not—he thought that the universities should be studying this question. It might even be that, on the contrary, the continual introduction of new weapons and defenses tends to make for stability, since each side is effectively deterred from striking as long as its weapon designers have to admit that they have not yet countered the other side's latest technology.

Another common assumption Dr. Craven does not accept is that the more missiles exist, the greater is the chance of a destructive accident. The evidence suggests to him that the reverse is the case—as our missile defenses have grown, they have actually become less accident-prone.

Dr. Craven frequently rebuked the critics of current U.S. strategy for their ignorance. If, for example, they were concerned about the steps that are being taken to defend the U.S. against China, why were they not regular readers of *Peking Review* (as he apparently is)? Remembering that whether an enemy is deterred from attacking depends on his psychology (which may be anywhere from rational to paranoid) and on his military thinking, it is necessary to gather every possible indication on these matters. "I commend to you the study of Red China," he told his audience.

Dr. Craven's integrity as an engineering thinker was demonstrated by his insistence on "near total" testing for all new systems (he cited a Second World War torpedo which failed lamentably, as an example of the alternative) and by the absence, in anything he said, of that emotional rhetoric which characterizes some of the more public military personalities. When the issue of inspection came up, for instance, he pointed to a basic asymmetry in the U.S.-Soviet relationship—the U.S. is a more open society, and things are published in *Aviation Week* which would not be publishable in Russia. Hence, in relation to any arms control agreement, the U.S.S.R. would need to be physically inspected in a way that the U.S. would not. Dr. Craven did not make this point the occasion for a political speech.

Finally, he demonstrated his understanding of the dilemma of a university such as M.I.T. in today's world. He had been asked whether such a university should evaluate the projects it undertakes from a moral standpoint. His reply began by acknowledging that academic researchers are constrained by the way financial support comes mainly from a small number of government agencies, with Defense at the head of the list. If a university does not approve of the resulting heavily-filtered spectrum of possible research, it can add a further filter, by inhibiting those fields that the government stresses. If he were a professor, said Dr. Craven, he would resent the first filter—but he would resent the second intensely. "I think you have a real dilemma." The meeting closed with Dr. Craven expressing surprise that—on the evidence of a quick head-count—only a minority of those present at the meeting had written to their congressmen to protest the uneven distribution of research funds.

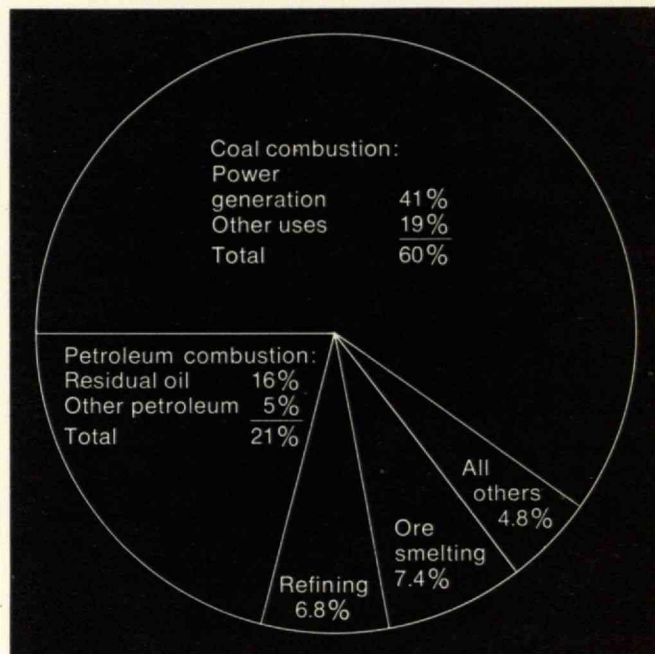
The discussion was one of many organized for two afternoons early in May, so that questions of concern to the Institute could be discussed by all interested members of the M.I.T. community.

What Happens to Air Pollutants

The U.S. Atomic Energy Commission is carrying out the largest ever field study on the question of "what have they done to the rain"—or, more prosaically, "the way rainfall cleans pollutants from the atmosphere." The idea is to trace the entry of pollution gases and particles into cumulus clouds, their progress through the clouds' water droplets and ice crystals, and their descent in rainstorms.

The study began in mid-May and will continue until mid-August. The area is that of the Illinois State Water Survey's rain gage network; participants include the Survey, the Argonne National Laboratory, and the Universities of Illinois and Michigan. Leading investigators are Glenn E. Stout, of Illinois and the Survey, A. Nelson Dingle, of Michigan, and Donald Gatz of Argonne. Incoming storms are followed by radar, and aircraft release natural tracers into them, to be measured subse-

Major sources of sulfur dioxide air pollution, according to F. A. Rohrman and J. H. Ludwig (Chem. Eng. Progr., Vol. 61, p. 59-63), cited in a recent review of atmospheric SO₂ reactions by P. Urone and W. H. Schroeder. A typical 350-MW coal-fired power station emits 75 tons of SO₂ per day.



quently at the Survey's 196 rain-gages. This and other work will help the A.E.C. to predict what happens to radioactive materials in the atmosphere, and will also, says the Commission, apply to other pollutants, such as sulfur oxides and lead from car exhausts.

The fate of atmospheric sulfur dioxide from a chemical viewpoint is also of considerable interest, and is far from well understood, according to two authors in *Environmental Science and Technology* for May, Paul Urone and William H. Schroeder of the University of Colorado. "The types of physiologically active substances which may be present in an atmosphere heavily polluted with sulfur dioxide and other industrial and domestic emissions, and which has been in a stagnant state over a city or valley for a period of days, are a matter of conjecture and serious disagreement," they write in a review compiled under a National Air Pollution Control Administration grant. (This particular statement is backed up by a reference to W. O. Negherbon, who has published studies of the SO₂ problem for the National Coal Association and Edison Electric Institute.)

Although sulfur dioxide is generally the major form of sulfur in polluted air, and its best known reaction is to sulfuric acid, many other compounds can result from the additional presence of other pollutants, and some of them may well be of "physiological importance" (to use a conventional euphemism).

No unified picture emerges from the publications re-

A nautical chart of Casco Bay, Maine, shows the calculated spread of a hypothetical oil spill. Each circle locates the oil slick at hourly intervals following the spill (smallest circle) in Hussey Sound on a flood tide. Such calculations would be useful in planning the deployment of confinement and clean-up systems if an actual spill occurred (see facing page).

viewed (about 65 of them) but the authors have tabulated reaction rates measured in a variety of conditions, and draw attention to some of the interactions that have been observed. These include the formation of sulfinic acids (compounds containing the $-SO_2H$ group) from hydrocarbons; the increased formation of aerosols from hydrocarbons and nitrogen oxides when sulfur dioxide is present; and the catalysis of sulfur dioxide oxidation by heavy metals. "Inasmuch as sulfur dioxide is constantly present in polluted atmospheres on an approximately steady-state basis, a large number of reactions of sulfur dioxide other than oxidation to sulfuric acid are possible during stagnant periods of severe temperature inversion. At such times, a mass of air can be subjected to many hours of solar irradiation and thermal catalysis."

Perhaps the best hope for the future is that it will become worthwhile for power and chemical companies to deliberately reduce their emissions of sulfur dioxide. That day may not be far off after all, to judge from a statement recently issued by the Lockheed Aircraft Corporation. Lockheed's Palo Alto Research Laboratory claims to have developed an electrochemical process for converting SO_2 effluents into sulfuric acid at an installation and operating cost which is low enough, according to Dr. Andrew J. Robell, to be covered by the sale of the acid.

Oil on the Sea: A Long-Term Problem

Today's is an oil-based technology. The world's total oil production is 1.8×10^{15} grams a year, and 60 per cent of this output crosses the oceans. Pollution is inevitable. But how damaging will this pollution be to the seas on which man may well depend in the future to feed his growing numbers?

Some 200 scientists came to M.I.T. this spring to ponder the question at a symposium on the scientific and engineering aspects of oil pollution of the sea. The day's discussions yielded much uncertainty and little comfort.

Max Blumer, Senior Scientist in the Department of Chemistry at the Woods Hole Oceanographic Institution,



estimated that 0.1 per cent of the oil shipped across the oceans—or 10^{12} grams a year—is lost to become pollution, and the seas receive additional oil from sewage and incomplete burning.

But hydrocarbons are not foreign to the ocean environment; the natural input from biological activity may amount to 3×10^{16} grams a year. Man's increment is therefore not really very large, and if it were broadly distributed could probably be metabolized in the natural system. But man's oil pollution is concentrated in harbor areas and occasionally around such unfortunate places as Santa Barbara and the Scilly Isles.

The long-term outlook for reducing oil pollution is not good, said Dr. Blumer. Oil consumption is increasing,

oil located offshore is a bigger and bigger factor in the supply, and there is growing use of toxic synthetic hydrocarbons. The problem is learning to cope.

Some hydrocarbons are toxic and some relatively harmless. The special danger is to the seas' delicate ecological balance. Many fish feed on crustaceans which feed on plants; if any part of the chain is destroyed the whole system may fail. There are also indications, said Dr. Blumer, that even low concentrations of hydrocarbons interfere with chemical communications which are important for fish spawning and finding food in the sea.

The problem, he said, is simply to "make sure in this generation that we do not do irreversible damage to marine life and thereby reduce the future harvest of the ocean."

How Oil Spreads and How to Stop It

One of the biggest problems with controlling large oil spills is that little basic research has been done on how oil spreads over the water or how spills can be mechanically controlled.

James Fay, M.I.T. Professor of Mechanical Engineering, and David P. Hoult, Associate Professor, have undertaken basic research in this field and reported preliminary findings to the experts attending the "Oil on the Sea" symposium.

"If we want to enclose an oil slick, we have to know how fast and far it spreads," said Dr. Fay, who went on to explain the theory of spreading he has developed. Four types of forces are at work in spreading an oil slick: inertial and gravitational forces work the first hour or two when the slick spreads most; viscous and surface tension forces then take over, though they cause only minimal growth. Wind, waves, and tides move a slick about but do not stretch it.

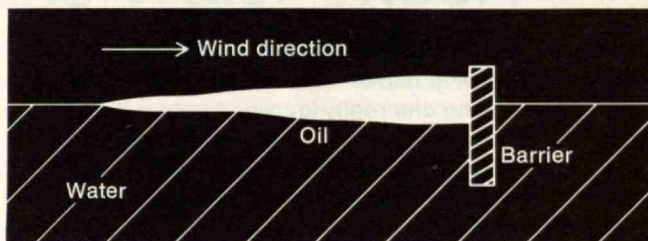
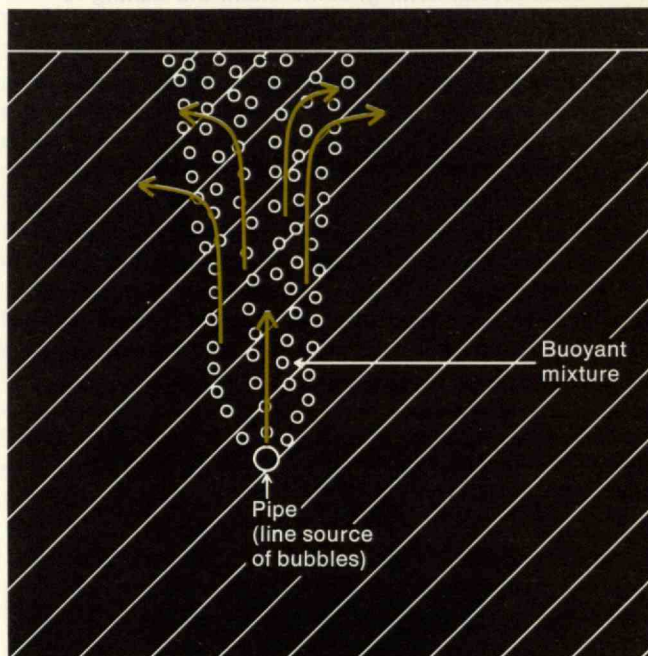
Dr. Hoult has experimented with two types of mechanical booms used to contain and collect an oil slick—a fabric curtain and a pneumatic boom.

The oil is driven against a fabric boom, gathers there, and as depth builds up, piles down so that 90 per cent of the oil is below the surface. But the oil easily leaks under the boom and even small waves prevent the boom from working.

The pneumatic boom has a source of bubbles below the slick; the bubbles rise to the surface and the vertical current is split into two horizontal currents, pushing away nearby oil. At present these pneumatic booms are power-limited, but a way may be found to reduce power requirements.

Theories and experiments now being formulated in the laboratory will eventually yield enough knowledge about

The top diagram shows a pneumatic boom in operation. A pipe emits a fine stream of air bubbles which mix with the water to form a buoyant fluid rising and separating into two horizontal currents. Oil located at a distance from the pipe will be pushed away from it by the action of this current. Below, oil is pushed against a floating boom by the wind. If the wind velocity is too great or the depth of the barrier too small, the oil will be forced under the boom.



the spreading and containment of oil slicks to allow engineers to carry out expensive, large scale experiments on the sea. Only one such experiment has been carried out, and that was 40 years ago.

Santa Barbara as a Pollution Laboratory

While man is just beginning to understand the scope of the problem of general oil pollution in the sea (see above), specific oil disasters like the Torrey Canyon and Santa Barbara spills have led to intensive studies of the effect of masses of oil on the ecological system.

The damage to birds and beaches has been well documented. But Robert A. Holmes of the Department of Biological Sciences at the University of California, Santa Barbara, told the M.I.T. symposium on "Oil on the Sea" that damage to marine life does not seem to be great, though conditions for accurate study have not been good because of heavy rains during the month before the spill.

Many sea mammals have been found dead but in almost every case oil was not the cause of death. Several seals were washed up on the Santa Barbara beaches, and it was immediately reported that oil had killed them; autopsy showed they had been shot, probably by fishermen. Controversy continues over the effect of the oil on commercial fishing: some claim the fishing is bad and some say it is better than ever. Several biological studies at various locations along the Santa Barbara Channel have shown little effect on plankton, eggs, or larvae, or on larger fish and crustaceans. The greatest damage occurred in situations where oil was washed on to rocks killing all organisms.

If the short-term effects on marine life do not seem great, Dr. Holmes pointed out, long-term effects are as yet unknown and could prove to be serious. Oil is still spilling into the Santa Barbara Channel at a substantial rate, so no doubt it will be a laboratory for oil pollution studies for a long time to come.

Enforcing Nothing

When oil is spilled in the ocean or on the beaches, who is responsible for doing whatever can be done (see above) to clean up the mess? The owner of the oil? The owner of the ship or well from which it spills? The government whose people are unlucky enough to receive it?

The answer is that jurisdictions are so confused that—in many cases—no one really knows.

Nor does it much matter, as things stand today.

This murky situation was described at the "Oil on the Sea" symposium at M.I.T. this spring, by Max Edwards, formerly Assistant Secretary of the Interior for Water Quality and Research, who is now a partner in the Washington, D.C., law firm of Collier, Shannon, Rill and Edwards. His conclusion: the question of who is responsible, knotty as it is, may be academic until greatly expanded research efforts lead to a technology which is in fact effective against oil pollution.

Pollution control in the U.S. goes back to the 1899 Rivers and Harbors Act, making unlawful the discharge of refuse in waterways or coastal waters. The next stage came in 1924, when an oil pollution control act made discharge of oil "a matter of liability without fault": the owner cleans up the mess he makes or—failing to do so—pays up to \$10,000 of the cost of doing the job.

But today, said Mr. Edwards, \$10,000 doesn't go very

Stream channels produced when water is released on to a soil surface in air (below). In vacuum (right), a dendritic ice mass is formed, which—on subliming away—reveals (lower right) a hummocky surface with explosion pits. (Courtesy of Air Force Cambridge Research Laboratory)



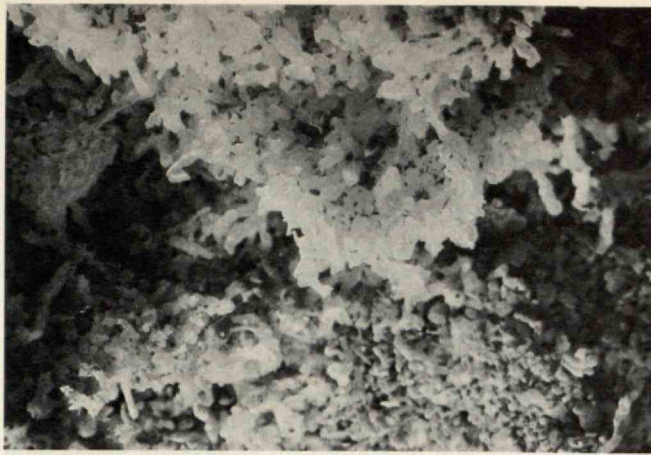
far, and so the 1924 act is useful only in the cases of small oil tankers and small spills. Furthermore, the 1924 act has been crippled by interpretations that require evidence of "grossly negligent or willful discharge"; the difficulty of proving either of these is great.

Most oil tankers serving the U.S. today are of foreign registry, controlled by international conventions. The enforcement of these agreements is at best spotty, and many of the nations principally engaged in oil tanker operations are not signatories to the conventions.

Only after the Santa Barbara pollution tragedy did the Secretary of the Interior impose the doctrine of strict liability on oil drilling operations on the continental shelf. But this was after leases were signed and—in many cases—drilling underway; and while it is clear that the Secretary of the Interior has the power to impose protective requirements, it is far less clear that he can do so retroactively, after a lease is operative, said Mr. Edwards.

No one can guarantee that there will be no pollution from offshore oil drilling, pumping, and transport operations. Indeed, said Mr. Edwards, accidents are apparently inevitable, it will be hard to prove negligence, and so it is probably inevitable that government will have to share the cost of clean-up.

The real negligence in the past may have attached to congressmen who passed laws and imposed restrictions which implied a power to control pollution and its effects which technology has not yet given to any man.



How Does Water Flow in Vacuum?

The idea that certain lunar surface features are the result of flowing water is becoming increasingly popular, and it has recently been suggested that lunar "rilles" could have been formed in this way even under vacuum—the idea is that a layer of ice would form above the water, preventing further evaporation, and something like an earthly river could then flow underneath the ice. At the Air Force Cambridge Research Laboratories, Bedford, Mass., J. E. M. Adler and J. W. Salisbury have tried to discover what in fact happens when water is allowed to flow over soil in vacuum, and have discovered that the vacuum makes a great deal of difference. That the experiment has not been tried before they attribute partly to the fact that it tends to ruin the vacuum system.

The soil consisted of crushed rock, of a wide range of particles sizes, in a tray 30 cm. by 42.5 cm. The vacuum was maintained below the triple point of water, while water was released into or on to the soil at about 300 ml/min. (There was an upper and lower practical limit on the flow rate, the former due to water spraying vertically and freezing-over the observation window, the latter to its freezing in the inlet tube.)

For the first few seconds, the water boiled explosively, "throwing soil and ice particles the full length of the test chamber." When enough ice had formed near the inlet to block this action, the water began to percolate

through the soil (not over it). At points outside the ice layer it repeatedly broke through the soil surface, always explosively, throwing off soil particles until a new ice plug had formed. Finally, the whole surface was covered with ice. This is shown in the second photograph, and the third shows the final soil surface below the ice. No channels are evident, as they are in the first photograph, which shows the result of carrying out the same procedure in air.

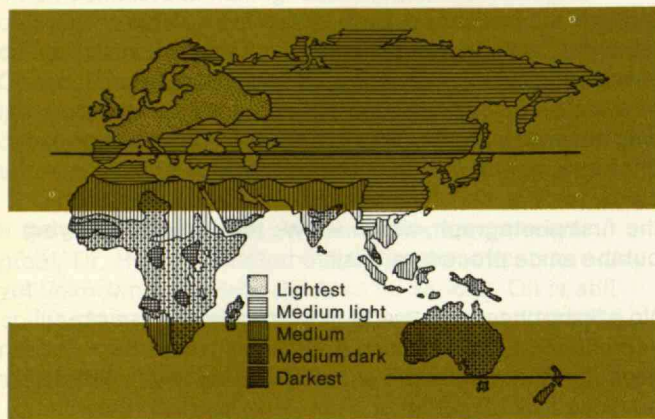
No attempt has been made to extrapolate these observations to larger scales, but the experimenters "believe that the results are as intriguing as the hypothesis advanced by Lingenfelter *et al.* (that sinuous rilles on the lunar surface could be produced by aqueous erosion under an ice blanket), and valuable for the insight they provide into the behavior of water in vacuum." (*Science*, Vol. 164, p. 589).

Lumps on the Moon: the Water Theory

The mysterious extra-heavy areas on the moon known as mascons (see *Technology Review for April*) are still engaging the attention of one of their original discoverers, Paul M. Muller, of the Caltech Jet Propulsion Laboratory. At the Spring Meeting of the American Physical Society, held in Washington, he noted that recent gravitational analyses have brought the number of identified mascons up to a dozen, and indicate that they take the form of flat discs at the surface. He favors the theory that they consist of material deposited out of bodies of water. This idea restores to its original meaning the early astronomers' term—seas.

The mascons all fall in circular depressed areas. Now, a depressed area should either be gravitationally lighter than its surroundings (simply because it is a hole) or roughly the same (as a result of the underlying rock adjusting itself). That these areas are in fact over-massive implies that something has been added to them, after the rock below had compensated for the weight-loss of the original crater. What has been added? The answer could of course be volcanic lava or drifting dust, but Muller is persuaded that the high-resolution photographs from Lunar Orbiter and Apollo cameras look as if water has been at work, depositing silt.

The distribution of human skin color in the Eastern Hemisphere before 1492 shows dark-skinned races clustered around the equator and white races in the far north. The heavy horizontal rules indicated 40° north and south latitudes, the unshaded area the tropics between 23° north and south. (From Science, August 4, 1967, adapted from Brace and Montague, Man's Evolution)



Vitamin D: A Key to Racial Colors

The species *homo sapiens* contains more variety than any other non-domestic animal—three distinct races on three different continents—and W. Farnsworth Loomis, Professor of Biochemistry at Brandeis University, has a theory about how these variations evolved. He explained at an M.I.T. seminar this spring that man's need for vitamin D may hold the key to racial skin colors.

Vitamin D is actually not a vitamin, but a hormone manufactured in the body which is necessary for growth of bones and calcification under normal conditions. The photochemical reaction which produces vitamin D requires ultraviolet radiation from the sun which converts the provitamin 7-dehydrocholesterol into vitamin D. Melanin, which gives skin its color, blocks ultraviolet rays from entering the body.

Dr. Loomis hypothesizes that man's predecessors moved north from equatorial regions, gradually losing their hair, leaving the skin free to soak up the ultraviolet rays which are much less intense near the poles than near the equator. Some of the group later migrated south, and dark skin developed as those who survived equatorial sunlight were selected out; too much vitamin D can be as harmful as too little.

In 1492, before mass migrations and colonization began, the world map showed clear racial patterns: white-

skinned Caucasians near the Arctic Circle and light aborigines in South Australia (darker in the north); yellow-skinned Orientals nearer the equator; and black-skinned Negroes in equatorial regions—all well adapted to their environments in terms of vitamin D. Northern Europeans, who are able to live so far north because of the Gulf Stream, adjust to the increase in ultraviolet rays in the summer with additional melanin, better known as sun tan, while no such adjustment is needed in the tropics.

Rickets, caused by a lack of vitamin D, first became prevalent during the industrial revolution in England when large clouds of dust covered industrial areas. Children and baby animals developed severe cases of the disease—sparking studies which led to understanding of the role of vitamin D. Food sources of vitamin D—fish and now fortified milk—were discovered, explaining why Eskimos, with yellow skin but a diet of fish, can live successfully in the Arctic Circle region.

Dr. Loomis went on the note that some folklore is based on the need for vitamin D. Northern Europe has a long-standing tradition that to be healthy, babies must be bundled up and taken outside in the middle of winter; the thin (therefore pink) cheeks admit enough ultraviolet light to produce the necessary vitamin D. And, said Dr. Loomis, "In the European tradition, when a boy looks at a girl he unconsciously admires her vitamin D potential." He notices straight legs and trim ankles; the word fair has come to mean beautiful as well as light; blond hair and blue eyes are demelanized, and pink cheeks show good ability to take in vitamin D. "In the tropics the definition of beautiful would obviously be very different," he added.

Heavy, Viscous Fluid

Does today's "massive disequilibrium" in the price structure of crude and refined fuel oil have within it the death knell of nuclear power generation?

After a year-long study of economic factors in energy production, two members of M.I.T.'s Sloan School of Management told a Nuclear Engineering Department seminar this spring that they think not. But the facts on which their conclusions were based led Manson

Benedict, Head of the Nuclear Engineering Department, to admit—half in jest—that “I’m disturbed.”

What Professors Morris Adelman and Paul MacAvoy meant by a “massive disequilibrium” is the difference between the market price and the actual production cost of oil. The difference, which amounts to some 15 cents per million B.T.U. in the price of energy delivered to electric power generators on the European continent (the locale chosen for the M.I.T. studies), derives mostly from the taxes paid to many government units and the royalties claimed by oil producing nations. Somewhere in between market and cost lies the “reference price” of oil—the price at which today’s nuclear generators are figured to be more economical than steam generators for producing electric power.

Professor Adelman noted that there has been a “steady and substantial decline” in the market price of oil in Europe, and he thinks that planners of future nuclear power installations must expect this trend to continue. But, he said, the price of oil is like “a heavy, viscous fluid.” Those designing reactors have got to keep their eye on a moving target, and—though its direction of movement is clear—the decrease in fuel prices will be slow . . . barring only “cataclysmic” political events in the Middle East. The stock of oil underground remains “enormous,” said Professor Adelman; he refused to forecast price increases based on scarcity in the predictable future.

“I’m not gloomy about the future of nuclear reactors,” Professor Adelman said, though there are so many imponderables in the predictions that “an interesting time will be had by all.” The only way to tell who is right about the 25-year cost projections made this year in the Sloan School of Management is to test them in 1990, agreed Professor MacAvoy. “If your colleague here is pessimistic concerning your future,” he told nuclear engineering students attending the seminar, “I’m pessimistic concerning my own.”

Auto Parts Monopoly

Members of the U.S. Senate, worried about the high cost of automobile repairs and the monopoly position of U.S. automakers, have been reassured. Competition in the auto parts business is increasing. It will be further increased if automakers stop selling repair parts and abandon their new-car warranty plans.

The purpose of these proposals, said Robert W. Crandall, Assistant Professor of Economics at M.I.T., to the U.S. Senate’s Subcommittee on Antitrust and Monopoly, is simply to increase “economic efficiency” in the automobile parts and repairs business.

The U.S. automobile industry has become more “vertically integrated,” said Professor Crandall—meaning that the auto makers themselves manufacture more of everything they need to build cars, relying less and less on parts suppliers and subcontractors. The result is

fewer and fewer auto parts makers selling a smaller share of a larger market.

Automobile manufacturers make “a large share of their profit” from auto parts production, said Professor Crandall, and they use several devices to maintain their parts sales positions—among them the industry’s frequent model changes and the secrecy surrounding them. Where an auto maker does depend on an outside source for a part, purchases are typically concentrated in such a way that there are no spares to be marketed on the side. Dealers are under pressure to use “authorized” parts instead of those which may be available from independent companies.

Professor Crandall cited figures to show that independent garages use fewer “authorized” parts than dealers’ service organizations, and independent garages’ service prices are lower. The price difference, he believes, “derives from higher costs faced by dealers.”

Taking auto manufacturers out of repair parts manufacture and distribution and letting them abandon completely the new-car warranty would be “a reasonable means” to reduce car repair costs by reducing parts prices, according to Professor Crandall. And there would be other advantages, as well: auto makers might then be persuaded to standardize car parts more fully; one incentive for frequent model changes would be removed; and the auto industry might reverse its trend to “vertical integration.”

Computers and Society . . .

As *Technology Review* showed in April (particularly in the articles by Professors Westin and Weizenbaum and Dr. David) there are certain dangers implicit in the availability of computers, and computer professionals therefore have a heavy responsibility towards society. In fact, a public reaction against computers is already detectable in the press and in the growing folk-lore of computer blunders and apparently computer-inspired impersonal treatment of individuals. So, at the Spring Joint Computer Conference of the American Federation of Information Processing Societies (A.F.I.P.S.) a session was held with the title "URGENT—Increased Dialogue with Society" and the object of recommending "specific actions to implement the discourse."

Hal Sackman, of the System Development Corporation, warned that the computer industry is creating a juggernaut, that the precondition for liberty is eternal vigilance, and that while other groups of scientists and technologists are getting into touch with society, the computermen are proving to be inherently conservative. Historically, in the data processing field, man has been dominated by the machine (for example, in the matter of language, and in the high value of machine time in relation to human time). Computermen generally come from mathematics and the physical sciences, so that collectively they lack human and social knowledge. Their efforts at taking the needs of society into account have been "amateurish" (he did not mention it, but this session was the only one organized too late to appear in the preprinted conference proceedings).

Mr. Sackman made three recommendations. Within the data-processing world, it should become customary to test complete systems—men and machines working together—rather than the machines in isolation as is the way at present (a practice upheld by "gentlemen's agreement between makers and users") Second, since all uses of computers are eventually social in their effects, the world of the computer professional must somehow be cross-fertilized with that of the social scientist. Third, systems with obvious social implications should be tested in the real world, rather in the manner suggested by Brandeis in 1932 for public utilities (the

idea, never carried out, said Sackman, was that entire states should be used as prototypes).

Finally, Sackman observed that the ethos of a culture could be seen by noticing what sort of heroes it produced. The computer culture looked up to certain outstanding brains (its super-hero being Von Neumann) but to none who were outstanding for their human qualities.

. . . Some Questions

The discussion period did not produce much ground for optimism. One young programmer, working for a well-known electronics company, told how she had begun to examine the morality of the work she was engaged in, and had tried in the process to discover what values inspired her colleagues and immediate superiors. The only motivation she found anywhere was money. Could the present session provide such people with the motivation they lack? The chairman said that the questioner should form a group within her organization. The idea of a group amused her: "I'm the only one!"

Another questioner was working on software that he saw could be used either for good or evil purposes—indeed, as a conscientious programmer he deliberately strove for generality. Was there any way of controlling the use to which such software could be applied? According to the panel, there was not, but in the ensuing exchange William Konigsford of I.B.M. pointed out that laws had been made to control the drug industry, and the same could in principle be done for computing. "It's a question of organization and dedication."

Towards the end, one speaker pointed out that there were two kinds of ethical questions: those on which agreement can be reached within the profession, and those—such as the defense issues—on which we find experts on both sides. The former, at least, could form the basis of a code of ethics, analogous to those of other vital professions like law and medicine.

The idea of professional ethics for computermen is far from new, but there is yet hope. A summary of the recommendations that came up at the session, compiled by Konigsford, will be submitted to the A.F.I.P.S. coun-

cil, for action. Konigsford's enthusiasm for the task was demonstrated by his circulating a list of literature sources on "computers and society" and by his offer, to anyone prepared to "find a place in their lives for society," to put them in touch with a field of action.

Nuclear Fusion Power Is Getting Closer

The goal of controlled-fusion researchers is to get a mixture of hydrogen isotopes to a sufficiently high temperature and density, and hold it there long enough, for it to undergo a self-sustaining nuclear reaction—similar to that of the hydrogen bomb but controllable. At the Kurchatov Institute, Moscow, conditions have been created that are significantly nearer to this goal than anything that has been done elsewhere, to judge from the account of the Institute's director, Academician Lev A. Artsimovich.

Dr. Artsimovich was at M.I.T. for six weeks in April and May, and during this visit he presented a series of lectures on his work with the "Tokamak" plasma device (regarding the name, he said, "Advertising plays a large part in plasma physics, and advertising is impossible without inventing a new name!").

The Tokamak is a horizontal toroid system—that is, one in which the gas is held in a doughnut-shaped ring. The gas, as in all such devices, consists of electrically charged particles (i.e. it is a plasma) which are kept from reaching the surrounding walls by a combination of magnetic fields. Holding extremely hot plasma together with magnetic fields is inherently difficult, and indeed the difficulties are central to all fusion-plasma research.

All toroid systems employ a magnetic field whose lines run around the ring, to cause the charged particles setting out for the wall to curve back inwards. In addition, a toroidal electric current is induced in the ring which results in an additional magnetic field. The net result is that the lines of force spiral around the doughnut. The field on the "hole" side is compressed somewhat, and thus more intense than that on the outside. This would tend to force the plasma-ring to expand radially. So a further field is added, running vertically, weakening and strengthening different regions of the spiral field so as to even it up.

Finally, the toroid is given a massive electrically conducting wall. Any tendency of the plasma-ring to move about sets up eddy currents in this wall, creating in turn small compensating fields that force it back into place. The biggest Tokamak toroid so far has a radius of 100 cm. and a thickness of around 35 cm. In it, a hydrogen plasma with a density of $7 \cdot 10^{13}$ ions/cu. cm. and a temperature of $5,000,000^\circ\text{K}$ has been contained for 0.3 seconds. This is about 10 times as long as has been achieved, with this temperature and density, elsewhere.

Under these conditions, a small, predictable amount of fusion takes place, and Dr. Artsimovich reports

that members of his team have in fact observed the neutrons given off by the fusion reaction. The neutron output is such as to confirm that the plasma conditions really are what the measurements suggest.

How near is this to a self-sustaining fusion reaction, generating enough heat to keep the plasma active, and some to spare? M.I.T.'s Professor Lawrence M. Lidsky commented that "fusion conditions" are hard to define, but a temperature 20 or 30 times as great and a density increase by a factor of two or three "would be very interesting," especially if the containment time could be increased somewhat at the same time. It is only a few years since the factors by which plasma devices fell short of fusion conditions were astronomical.

Of course, once fusion conditions are reached, this will still bring us only to the stage equivalent to Fermi's original atomic pile of 1942—the technology of power generation remains to be developed. At M.I.T., Professor David J. Rose has been studying the engineering of nuclear fusion for some years. But when Dr. Artsimovich is asked how long it will be before plasma research finally gives us practical power from hydrogen, he tells one of the myriad tales of Nasrudin (a legendary Middle Eastern sage, who enjoys wide popularity in Russia):

A certain sultan gave Nasrudin a large sum of money, on the understanding that, in 15 years, he would teach his donkey to recite the Koran. On being berated by his wife for thus placing himself in danger of severe punishment for failure, Nasrudin replied: "In 15 years, one of three things will probably happen. Either I will die; or the Sultan will die; or, most likely, the donkey will die."



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A.B.M.: The Software Barrier

Have men erected structures and then superstructures of technology so complex that they are now beyond their creators' control?

Cambridge scientists arrayed against the Department of Defense proposal to deploy the Safeguard antiballistic missile defense system suggest that the question is far from rhetorical. And among them, Dr. Jerome B. Wiesner, M.I.T. Provost and former science advisor to the late President John F. Kennedy, has played a leading role.

In a special report on the A.B.M., commissioned by Senator Edward M. Kennedy and published as *A.B.M.: An Evaluation of the Decision to Deploy an Antiballistic Missile System* (Harper and Row and New American Library), Professors Wiesner, Abram Chayes of the Harvard Law School, George Rathjens, M.I.T. Professor of Political Science, and Steven Weinberg, M.I.T. Visiting Professor of Physics, base an important part of their case on the contention that the Safeguard system cannot be made reliable. It represents "the most sophisticated and intricate system that man has attempted to build," Jerome B. Wiesner, Provost of M.I.T., told the Senate Committee on Foreign Relations in summarizing his and his colleagues' uneasiness. "Each individual component must . . . be more reliable than those in present-day units if the system is to achieve the needed overall reliability," he said. Of the several components involved—radars, missiles, and computers—it is the computers which seem most suspect, he argued.

The Safeguard concept includes time-shared computers to interpret radar signals, track and identify incoming objects, predict trajectories, allocate and deploy interceptor missiles, and detonate their armament when within range of their targets. All of this must be fulfilled "continuously and with split-second precision during . . . ten minutes at most between the time the attacking missiles first appear on the radars and the moment of impact." Superimposed on these requirements is the computers' need to control their own use of their time and to check their own performance for defects.

All this will require computers "much more complex than any previously used in a military application," Dr. Wiesner told the Senate committee. "In my judgment the pattern of delays and failures in electronic systems" which, he said, has characterized post-World-War II military experience will recur.

Real uncertainties also arise in connection with programming. "There are no working examples today of huge computer programs on the scale required by the A.B.M. program," Dr. Wiesner told the Senate Committee, "and the body of experience with complex problems of a smaller scale inspires no confidence." As Edward E. David, Jr., of Bell Telephone Laboratories, Inc., wrote in *Technology Review* (April, 1969, p. 6), "production of large software has become a . . . field with a reputation as a costly, unending, profitable

morass. . . . There are good reasons why software tasks involving novel concepts involve not only uncalculated but uncalculable risks."

Does the undeniable and nearly complete success to date of man's most complex technological effort—the Apollo moon mission—compromise these anti-A.B.M. arguments? Perhaps not. Instead of one Apollo capsule, the Safe-guard computers must deal with an unknown number of missiles and non-missiles on unknown trajectories and at the same time operate inceptors—all on schedules unpredictable to its operators. A better comparison may be with SAGE, the most ambitious air defense system heretofore undertaken by the U.S. In this case, building the computer program "was never adequately done," Dr. Wiesner told the Senate, "and I am under the impression that the effort has been given up."

The Computer: A Social Bridge

The gap between computermen and the rest of society is growing (see "*The Two Cultures of the Computer Age*" by Joseph Weizenbaum in *Technology Review* for April, 1969). Thus there is special interest in a report at the Spring Joint Computer Conference in Boston this spring of a Lowell Institute School experiment in bridging this gap at its widest point: between the computer and the dropout.

Whereas other more or less successful efforts at teaching the underprivileged generally seem to work with small numbers of students, the Lowell Institute School program teaches 500 on a shoestring budget of some \$10,000. Simultaneously, the program offers courses for the "overprivileged," thus establishing another bridgehead: potential employers.

Last year the School began advertising a basic course in programming to be given by John J. Donovan, Assistant Professor of Electrical Engineering at M.I.T. There were 1,000 responses, and—making no attempt at screening for education or aptitude—Professor Donovan selected 500. The truly underprivileged, "suffering from the crippling syndrome of education-motivation-employment deprivation," were about 200, the majority black. In addition, there were 250 somewhat less underprivileged people, including some "undesirables" (50 Ph.D.'s) who really suffered from no gap at all. About 20 M.I.T. students—unpaid—went about the teaching task; the Institute's few black students were heavily represented among these volunteer instructors.

So far, the team has given three courses. First comes computer programming; this awakes in the pupils—often for the first time in their lives—an interest in mathematics, which is therefore the second course. Third is a course that can roughly be described as servicing. Familiarity with the hardware stimulates a need for the fourth course, currently planned, which is physics. Dr. Donovan and other speakers reported that, where everything else in our educational system has failed completely, computers have succeeded; working with computers often elicits a strong intellectual response among the underprivileged.

Meanwhile, the overprivileged, "senior men in industry who are very well educated but need retraining in some aspect of recent technology," have been getting an advanced systems programming course. They pay the same nominal fee as the rest, because the work is being done under the auspices of the long-established Lowell Institute School (affiliated with M.I.T.) whose custom it is to charge no more than the price of two bushels of wheat.

One hope is that some of these senior men will help in finding work for the newly trained youths. An M.I.T. student-run company, recently formed, is aiding in the same task, in answer to the complaint that employers of computer personnel—particularly the larger companies—pay too much attention to paper qualifications and too little to actual ability.

A Cabinet for Massachusetts

The Governor of Massachusetts has 173 subordinates reporting directly—and only—to him. Small wonder that the state government looks like “a vast collection of agencies that nobody runs,” says Robert C. Casselman.

The prescription he has proposed for the Commonwealth's ills is like that for an industry's in a similar plight, says Mr. Casselman, who is Executive Secretary of Governor Francis W. Sargent's (M.I.T.'39) Advisory Committee on Modernization: establish a “cabinet” of secretaries to whom the 173 agency heads can report—thus giving the governor a chance to get his own work done.

Next, give these secretaries “the one power they have to have—the power to say ‘no’ to a budget request,” a fundamental principle of management, says Mr. Casselman, who is a Cambridge management consultant and has served as Lecturer in M.I.T.'s Sloan School. Today the Commonwealth's budgets are not based upon any evaluation of previous achievement. “The game,” Mr. Casselman told the Cambridge Chamber of Commerce this spring, “is simply to get all you can.” Finally, give these secretaries the power to rearrange the authority of their agencies, eliminate duplication, and establish lines of command.

The state's management structure has not changed significantly in the past 50 years, Mr. Casselman says. But in the last 10 years the state budget of Massachusetts has trebled to become a \$1.5 billion business with 60,000 employees. In the next five years it will double again in both size and cost.

Apprentices Are Modern

Criticizing higher education in the United States as resembling a detective story which begins “not with the crime, but with a long discussion of the nature of legal systems,” Jerrold R. Zacharias, Director of the M.I.T. Education Research Center, advocates rewriting the story along a completely different plot: the apprentice system.

Professor Zacharias wrote in the first issue of the education magazine, *Change*, that he believes professional education begins in early childhood—but that elementary schools, high schools, and even colleges tend to dissipate these childhood enthusiasms.

“Someone might start to become a physicist with, for example, a Meccano set, a radio, or a Model T Ford . . . These highly motivated young people receive similar general education in elementary and secondary schools, but when they reach college they believe that they will begin to move closer to their professions,” he wrote.

“What our colleges generally do, however, is to put these students through a series of courses which are designed to improve their ability to do something but which do not come close to the profession that they want to pursue.”

He advocates starting students on a six-, eight-, or ten-year apprentice program in a specific profession after junior high school. “Let them tackle it as if they were going to be in that profession,” he said. But “obviously, a great many students . . . do not know what they want to do. One has to help them find out, and one way to help them is to have them make a commitment.”

Professor Zacharias firmly believes that his program would significantly change current, broad, liberal arts programs which are based on the “myth” that they prepared the student to do anything he chooses. “Most especially what this does not do is to help a student make up his mind.”



Boston schoolchildren at the Hayden Gallery:

(top) With Mrs. Nan Arghyros of the M.I.T. Office of Exhibitions viewing a Dogon (Mali region) mother-and-child figure.

(center) An astonishing animal group spirals up from a Yoruba (Nigeria) Gelede mask.

(right) A schoolteacher discusses the iron sculpture of Gu, god of iron and war of the Fon (South Dahomey region), one of two such figures known to exist.

(below) A Mende (Sierra Leone) helmet mask.

(below, right) Richard Allert, a Boston student who worked with the exhibition as lecturer, explains a group of masks from the Luba peoples (Congo).



African Art and the New Dawn

Some 70 sculptures from West, Central, and Southern Africa, plus an impressive array of Ashanti gold work—all lent by Paul Tishman (M.I.T. '24), who owns one of the major private collections of African art—were shown at M.I.T.'s Hayden Gallery in May and June.

It was an exhibition unique in Boston for its content—and as well for its demonstration of the universality of visual language.

Through the efforts of Hans Guggenheim, an anthropologist who is Visiting Assistant Professor of History at M.I.T., and Dana Chandler, a Boston artist, school groups from the predominantly black Roxbury district of Boston were invited to tour and study the exhibition, so that they could learn something of the people who made the masks, figures, and jewelry.

And when its popularity became obvious (more than one group signed up to visit each day), Professor Guggenheim and Patsy Asch of the Education Development Center prepared an informal guide book designed to offer something for all ages: accounts of the use of ceremonial masks and figures in African drama and legal procedures, instruction in mask-making, practical techniques of metal-working (including the lost-wax process, in the form of a passage from T. E. Bowdich's *Mission to Ashantee*, 1819, describing the gold-molding method), and—for the youngest—the Ashanti “bean game.”

The conventions with which we approach European art are not fully appropriate to African. In Africa “in most instances the ‘meaning’ of the arts was broadly known. The arts were part of the normal experience of the average member of the culture,” writes Roy Sieber. And Mr. Tishman (on his discovery of the nature of African art): “I came to realize that no matter in what part of Africa the material originated and no matter how diverse the tribal or regional styles, through most of it runs the same spirituality, the same invocation of magic, the same attempt to express in image form the unknown forces with which the African had to deal in his daily life.”

Professor Guggenheim and Mrs. Asch, writing for the youngest children, reach a different level. For example, on masks: “For the people who created them, (masks) had powerful meaning beyond art. Through masks man projects himself into the world of the sacred and mysterious where he is in touch with the spirits of his ancestors, the spirits of the rivers and the forests. . . . You, too, can make masks. As you do, think about the figure you wish to portray. Should the character have a human face, or would it be more powerful to use an animal or some other symbol? . . . Do you want a mask that will make people afraid, or sad, or happy, or uncertain? You must decide. . . .”

In his introduction to the student guidebook, William A. Gordon, Jr., an M.I.T. graduate student in physics, assured the young visitors that the collection could be for them “the beginning of a proper perspective of the black man. Look deep, for soon there's gonna come a new dawn—a new day,” he wrote.

Professor Guggenheim, who has published research on African iron work, finds another dimension of interest for a future exhibition at the Institute; he hopes next year to bring to M.I.T. an exhibition of African iron work. Such exposure could lead to a new appreciation of indigenous African technology—and hence to a greater curiosity about it.

Indeed, says Professor Guggenheim, pre-colonial African metal work was by no means as primitive as is often imagined. Some has been erroneously classified as European, on the basis of its sophistication of technique and workmanship. There remains much work to be done in tracing the patterns of Africans' mining and manufacturing before their domination by Europeans, and in such research the help of metallurgists and engineers can be of great value.

Correspondence Review

Neither Red nor Dead

To the Editor:

Dr. Jerome B. Wiesner's eloquently stated, but dangerous, position (Technology Review for March, 1969, page 76) could be clarified by his response in simple terms to an old question: Would *he* rather be *red than dead*? If his answer is "red," then his rhetoric becomes crystal clear. If his answer is "dead," then his rhetoric becomes obtuse if not absurd. Real Americans would rather be dead.

Supposedly, our elected officials will review the available information and take the necessary steps to guarantee our freedom. We presume that is also what Dr. Wiesner was paid for when he was on the government payroll. One wonders, however, what goal he had from his statement: "I proposed that we seek a ban on antiballistic systems and a freeze on offensive nuclear weapons."

Perhaps Dr. Wiesner should consult with the Czechs and the Hungarians for a more enlightened understanding on the Soviet Union's willingness to arrive at reasonable conclusions based on discussions. Slavery is perfect peace, if you are master or if you don't mind being a slave. I would.

Carol E. Belton
Houston, Texas

Dr. Wiesner replies as follows:

I have no desire to be either "red" or "dead." I want to live in a free decent society in which reason and hope rather than fear and prejudice are the dominant motivations. I want us to use our boundless talents and resources to make a better world for all, and I am convinced that only by eliminating the arms race is there a hope of creating such a world. I believe that we have enough mutual interest with the Soviet Union and the Chinese People's Republic in preventing nuclear war and being able to employ our respective resources more intelligently, to make a serious effort at arms reduction worthwhile. I also happen to believe that in the short run we could improve our security by achieving a ban on anti-ballistic missile systems and a freeze on offensive nuclear weapons, as I have often proposed.

This is not just a visceral or emotional position. I have come to this conclusion after much thought and study of the questions involved, including a thorough examination of the danger presented by the possibility of noncompliance by some of the participants in such agreements, and I believe that our security can be amply safeguarded against all eventualities. I am not an advocate of unilateral disarmament but rather of substantial, safeguarded reductions of strategic forces and more effective international peace-keeping arrangements. It is at least conceivable that the smaller nations of the world, including Hungary and Czechoslovakia, would fare considerably better in the kind of world I would like to create than they do in the present confrontation situation.

How Far and How Much?

To the Editor:

The review of Mr. Kryter's paper on Supersonics and the People Underneath (see "Trend of Affairs" in Technology Review for April, 1969, page 74) ends with a curious paragraph:

"Mr. Kryter has cast his net very wide, and seems to have caught nearly everything that can provide food for thought about the objectionableness of the boom. Even so, he admits that his financial predictions could be out by a factor of two either way. This imprecision in current estimates of the effects of sonic-boom noise pollution makes an odd contrast with the aerodynamics and engineering that have made such pollution possible."

So what?

It has been amply demonstrated that the accuracy of predictions of the cost of research and development by the scientists and engineers responsible for a program sets no high standard for precision. To attempt to discredit the validity of a serious study of a very serious problem, by this comparison, is to imply that other considerations can be ignored if the dollar cost of repair of physical damage is reduced to an acceptable level.

This is to ignore the facts. Some years ago Dr. Draper was quoted in *Fortune*

as saying that there was a lot of junk around the country which got that way because designers didn't know what they hadn't taken into account. Mr. Kryter's study is a step toward the solution of the mandatory requirement that such an oversight be prevented in this case.

To argue that we must implement to its physical limit every technique which our laboratories are capable of perfecting, regardless of polluting side effects, makes no more sense than to chop down a cherry tree because one has been given a new hatchet.

Edward A. Merrill
San Francisco, Calif.

Far from attempting to discredit Mr. Kryter's excellent study, we were trying primarily to draw attention to it, and then—in passing—to point up the difficulty under which it was done, namely the regrettable dearth of hard data. Whoever is to be blamed for this, it clearly is not Mr. Kryter.—Ed.

Strobe Probe

Harold E. Edgerton

The Tortoise and the Hare

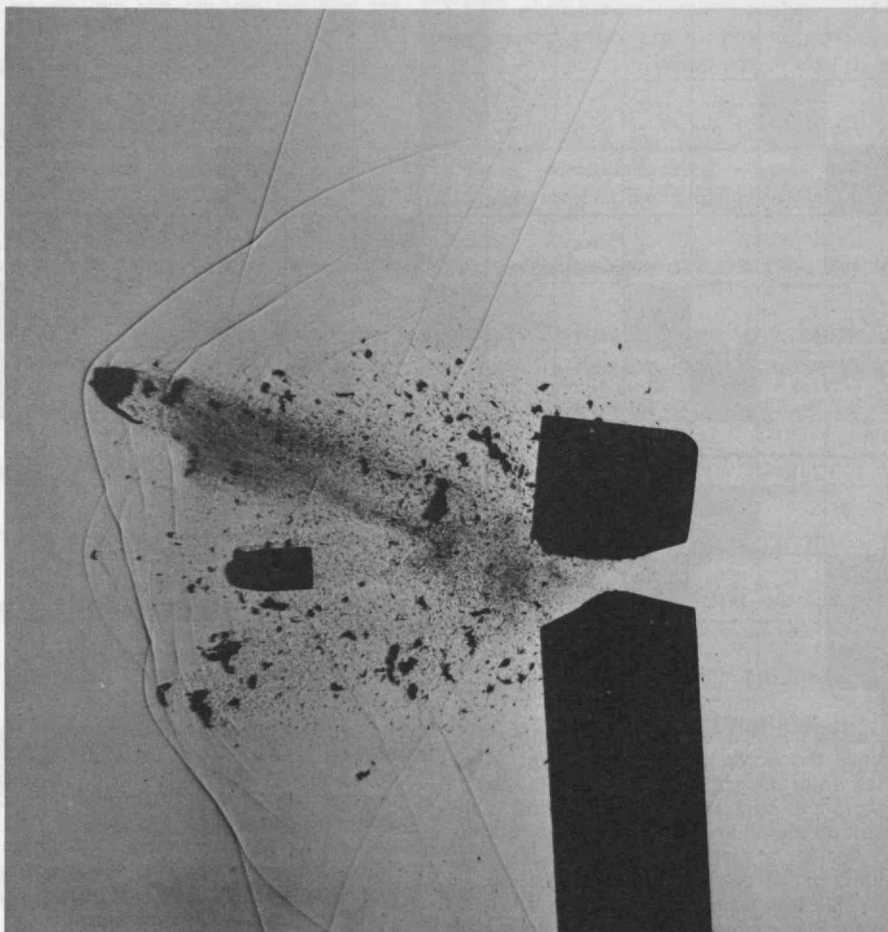
Students in my freshman seminar (see *photo below*) have been experimenting with making silhouette photographs of bullets. In this one they captured a bullet just as it penetrated a card, and they were surprised to find that the paper fragments in fact move faster than the bullet.

Why?

Readers are invited to comment.

Harold E. Edgerton is Emeritus Institute Professor at M.I.T.; he is widely known for imaginative uses of stroboscopy in high-speed photography and other applications and as an inspiring teacher.

The Undergraduate Seminar in high-speed photography: (left to right) Drew A. Gillett, Professor Edgerton, Charles D. Hant, Bonnie P. Miller, Scot M. Stoney, Robert S. Cohen, Michael K. Stauffer, Richard D. Fish, Eugene T. Viens, Jr., Don I. Falkenstein, Nagasato Uchida, Gregory R. Shubin, Donald S. Setzler, Christopher K. Davis, and John D. Hyde. In the foreground are Gus P. Kayafas, '69, laboratory assistant who made this photograph, and James L. Davis.



Tech-Crostic

David L. Holt

J	I	V	2	A	3	K	4	C	5	Y	6		P	7	G	8	I	9	K	10	Z ₂	11	N	12	A	13	X	14		Z	15	B	16	G	17	Z ₁	18	
O	19		V	20	K	21	U	22	O	23		R	24	E	25	Z	26	I	27	Z ₁	28		S	29	A	30	Z	31	F	32	T	33	H	34	M	35		
		D	36	M	37	K	38	I	39	Z ₂	40	U	41	R	42	S	43		N	44	Y	45	K	46	G	47		R	48	G	49	C	50		I	51		
W	52	D	53	T	54	P	55	K	56	Z	57	Z ₂	58		S	59	C	60	Z ₁	61		E	62	O	63	Y	64	W	65	D	66	G	67	I	68	Z	69	
N	70	A	71	Z ₁	72		X	73	K	74		P	75	I	76	S	77	Y	78	M	79	A	80		X	81	U	82	T	83	W	84	J	85	Z	86		
E	87	B	88		Q	89	Z ₁	90	Y	91	U	92	K	93		L	94	V	95	D	96	H	97		P	98	Y	99	Z ₂	100	A	101	N	102				
W	103	Z ₂	104	K	105	X	106	S	107	C	108	Z	109		G	110		F	111	Z ₂	112	I	113	M	114		Y	115	Z	116	I	117	N	118	C	119		
S	120	W	121		I	122	L	123	X	124		F	125	I	126	Y	127		I	128	D	129	Z	130	P	131	S	132	K	133	A	134	L	135	V	136		
		K	137	O	138		B	139	M	140	I	141	E	142	U	143	Z ₁	144		F	145	I	146	W	147		J	148	R	149	W	150	H	151	A	152		
		M	153	S	154	E	155	T	156	W	157	I	158	A	159	P	160		F	161	Z ₂	162	G	163	Z	164	Q	165	K	166	B	167	X	168	I	169	D	170

Use the definitions at the right to help define the words to which they refer; then enter the appropriate letters in the diagram to complete a quotation from a work on metallurgical history which will be familiar to many readers. The first letters of the definitions give the author and title from which the quotation is taken. Black squares in the diagram indicate the ends of words; when there is no black square at the right end of the diagram, the word continues on the next line.

The correct solution to this Tech-Crostic appears on page 97 of this issue of *Technology Review*.

David L. Holt is Assistant Professor of Metallurgy at M.I.T. He will welcome readers' comments; address him in care of *Technology Review*, Room E19-430, M.I.T., Cambridge, Mass., 02139.

				1	A		2	U		3	S				4	S				5	D		6	O				7	P								
8	C	O	9	M	E	N	C		E	M	E		10	N	T				11	E	12	R	R	O	R		13	A		14	P		15	A			
	I		16	E	U					V				17	F	R	18	O		19	D	A		20	A	21	S		22	I	N	23	S	T			
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	E		29	T	T		B		R								P										30	C	D								

Technological Crossword

The correct solution to the Technological Crossword by John M. Sandor appearing in *Technology Review* for June (page 78) is shown above.

A. Sodium bicarbonate.

B. Suitable, fit.

C. Linen tape or braid.

D. See word Z.

E. Distance forward from bow to anchor.

F. Adjust, reconcile.

G. Oboe.

H. Family, kind, breed, class.

I. Phenomenon allowing flow visualization (2 words).

J. Large cask.

K. Concentrated sulfuric acid (3 words).

L. Loud quarrel.

M. Named (archaic).

N. A fat, liquid at ordinary temperatures.

O. Kindred.

P. A standard or unit measurement.

Q. Unit of measurement for printed matter.

R. Muscle, sinew.

S. Plant whose leaves are depicted on a Corinthian column.

T. Lacking stiffness.

U. Leper.

V. Welsh given name.

W. A resistor used with an electronic tube (2 words).

X. Answer.

Y. Bearing or conducting inward.

Z. A sphygmograph.

Z₁. Cluster of stars in the head of word D.

Z₂. Mustard gas.

80 159 3 101 152 13 71 134 30

139 88 16 167

119 60 5 108 50

129 66 36 96 53 170

25 142 62 87 155

145 111 32 161 125

49 110 8 17 67 163 47

151 34 97

128 158 126 39 68 169 9 76 146

113 51 122 117 27 141

148 1 85

10 56 93 137 74 105 4 133 166

38 21 46

135 123 94

35 153 79 140 114 37

44 118 12 70 102

138 63 19 23

75 98 55 131 160 7

165 89

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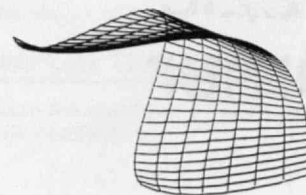
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130

28 72 18 61 90 144

58 11 104 162 40 100 112



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Puzzle Corner

Allan J. Gottlieb

Year-end report on amplifier: My new roommate, Ron Kadomiya (M.I.T. '67) is a mechanical engineer at Raytheon here in Waltham. He came over and we traced the trouble to the right channel (the same channel on which Dynaco previously replaced a capacitor). He gave the amplifier to an electrical engineer friend of his at the laboratory who ascertained that four—count 'em, four—transistors were blown. Of course the two output transistors were among them. I have purchased replacements and he is to check everything out before I reuse the amplifier. We're so hopeful now that Ron is thinking about buying speakers. I find this definitely a better idea than my buying the speakers.

As promised, no new problems this month, since the answers could not be published until fall.

Solutions

25 Let N be the number of positive integers which contain no digit more than once when they are expressed in base b where b is an integer greater than 2. Show that N is always composite.

The following is from Stephen Owades, who is a freshman at M.I.T.:

"In a base b , one can have positive integers of from 1 to b digits in length without repeating digits. There are $(b-1)$ ways of filling the first digit (1 through $b-1$), $(b-1)$ ways for the second (0 through $b-1$ less the one in the first position), $(b-2)$ for the third, and so on through $(b-k+1)$ for the last, where k is the number of digits. Summing for all k , we get

$$N = \sum_{k=1}^b (b-1) [(b-1)(b-2)$$

$$\dots (b-k+1)]$$

$$= (b-1) \sum_{k=1}^b [(b-1)(b-2)$$

$$\dots (b-k+1)]$$

For $b > 2$, $(b-1) > 1$, and it is obvious that the sigma expression is likewise > 1 . Therefore, N is the product of two integers greater than 1 and thus is composite."

Also solved by Eric Hovemeyer and Messrs. Friedman, Grant, Hauser, Karger, Prussing, Ross, and Rubin.

26 Find the smallest integers m and n such that $m - n^3$, m , and $m + n^3$ are all perfect squares.

Douglas J. Hoylman solved this one. He writes:

Let

$$m - n^3 = p^2, m = q^2, \text{ and } m + n^3 = r^2.$$

Then we obtain the equations

$$q^2 - p^2 = n^3,$$

$$r^2 - q^2 = n^3, \text{ and}$$

$$r^2 - p^2 = 2n^3.$$

Since $r^2 - p^2$ is even, r and p must be of the same parity. But since even and odd squares, respectively, are congruent to 0 and 1 mod 4, $r^2 - p^2$ must be divisible by 4. Hence n^3 , and thus n , is even. Now suppose n is not divisible by 3. Then neither is n^3 or $2n^3$. If the difference of two squares is not divisible by 3, it is easily seen that one of the two numbers must be divisible by 3 and the other one not. But this cannot be true of all three pairs (p,q) , (p,r) , and (q,r) . So we derive a contradiction, and n must be divisible by 3. Hence n is divisible by 6. We try the smallest possible value, $n = 6$. Then we must find integral solutions of $r^2 - p^2 = 432$.

Factoring the left side, we see that we must have

$$2r = (r-p) + (r+p) \\ = 2^a 3^b - 2^{(4-a)} 3^{(3-b)}$$

where $a = 1, 2$, or 3 and $b = 0$ or 1.

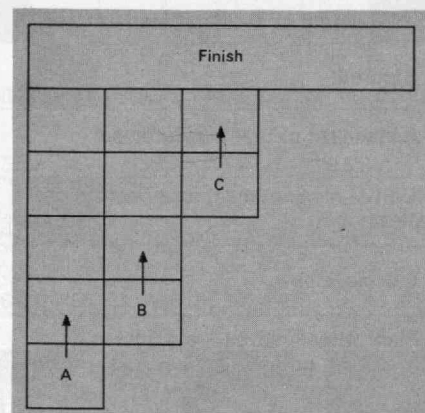
(We exclude $a = 0, 4$ because the right side must be even, and $b = 2, 3$ by symmetry.) Of the six values for r thus obtained, the smallest is $r = 21$ (from $a = 3, b = 1$). Then we obtain $p = 3, q = 15$, and $m = 225$. This is clearly the smallest solution.

Also solved by Robert G. Hall, Hubert du B. Lewis, Captain George Martin, Robert G. Mays, John E. Pruessing, and T. Terwilliger.

27 Smith D. Turner wrote, "For betting purposes, a horse race is sometimes simulated by having a number of wooden horses run a course of several moves, the one to move each time being determined by lot. For example, use six horses, throw a die, and the first whose number is thrown (say) 10 times wins.

To make this more interesting, I have set it up where one horse must move only a few times, and others increasingly more, to win—thus creating a 'favorite' and 'long shots' in the betting—say 2, 3, 5, 6, 8, and 10 moves with six horses.

"I have found it extremely difficult to calculate the probabilities for such a set-up. Even with a much simplified race—e.g., three horses having to move 5, 4, and 2 times (below)—the calculation was very laborious. In the case illustrated, I get the probability of the favorite C to win as 15001/19683.



"Could anybody check this and—more importantly—come up with a method, computer or otherwise, of handling a more complicated race, say the 2, 3, 5, 6, 8, 10 above?"

Here are the best parts of two solutions received. Harold D. Shane supplies the method:

Let us have k possible outcomes to an experiment, and let the j th outcome have probability P_j , $j = 1, \dots, k$. $P_1 + P_2 + \dots + P_k = 1$. Let $t_{n,j}$ equal the number of occurrences of outcome j in n trials. Let n_j be the number of outcomes needed for the " j th horse to win." Then $\Pr \{j\text{th horse wins on trial } n\} = \Pr \{\text{outcome } j \text{ on trial } n\} \times \Pr \{(t_{n-1,j} = n_j - 1) \mid (t_i \leq n_i - 1 \mid i = 1, \dots, k \mid i \neq j)\}$. Let $P_{n,j}$ be the probability given above. Now

$$n_j \leq n \leq n_j - \sum_{\substack{i=1 \\ i \neq j}}^k (n_i - 1)$$

$$n_j \leq n \leq \sum_{i=1}^k n_i - (k-1)$$

$$\text{Let } N = \sum_{i=1}^k n_i, \text{ then}$$

$$n_j \leq n \leq N + 1 - k$$

To somewhat simplify the notation, let us assume that we shall renumber the horses so that we always want $P_{n,k}$, so that

$$\Pr \{\text{kth horse wins}\} = \sum_{n=n_k}^{N+1-k} P_{n,k}$$

Now,

$$P_{n,k} = P_k \sum_{r_1=0}^{n_1-1} \dots$$

$$\sum_{r_{k-1}=0}^{n_{k-1}-1} \binom{n-1}{r_1, r_2, \dots, r_{k-1}, n_k-1} P_1^{r_1} \dots P_{k-1}^{r_{k-1}} P_k^{n_k-1}$$

where

$$\binom{n-1}{r_1, r_2, \dots, r_{k-1}, n_k-1}$$

is to be interpreted as zero whenever

$$r_1 + r_2 + \dots + r_{k-1} \neq n - n_k.$$

For the problem described,

$$P_1 = P_2 = \dots = P_k = 1/k$$

$$\text{and } P_1^{r_1} \dots P_{k-1}^{r_{k-1}} P_k^{n_k-1} = 1/k^{n-1}$$

and thus

$$\Pr \{\text{kth horse wins}\} = \sum_{n=n_k}^{N+1-k} 1/k^n \sum_{r_1=0}^{n_1-1} \dots$$

$$\sum_{r_{k-1}=0}^{n_{k-1}-1} \binom{n-1}{r_1, r_2, \dots, r_{k-1}, n_k-1}$$

In particular, for $n_1 = 5, n_2 = 4, n_3 = 2,$

$$k = 3, N = 11$$

$$\Pr \{\text{favorite wins}\} =$$

$$\sum_{n=2}^9 1/3^n \sum_{r=0}^4 \sum_{s=0}^3 \binom{n-1}{r, s, 1}$$

$$= 15001/19683.$$

The other problem yields

$$n_1 = 10, n_2 = 8, n_3 = 6, n_4 = 5,$$

$$n_5 = 3, n_6 = 2, N = 34, K = 6$$

$$P \{\text{favorite wins}\} = \left(\sum_{n=2}^{29} 1/6^n \right) \times$$

$$\sum_{m=0}^2 \sum_{l=0}^4 \sum_{k=0}^5 \sum_{j=0}^7 \sum_{i=0}^9 \binom{n-1}{i, j, k, l, m, 1}$$

which involves fewer than (29) (2) (4) (5) (7) (9) terms, certainly well within the reach of a reasonable computer.

David Dewan wrote a program to solve this. The job ran 9½ minutes and concluded that the probabilities are .643, .282, .050, .020, .003, and .0004. Off to the races, Mr. Turner.

28 and 29 As usual, anything influenced by Andrew Egendorf (an M.I.T. student colleague) turns out as a disaster. No one responded. Poor George Starkshall should only be criticized for penning his

name to an Egendorf creation. Throughout my stay in M.I.T.'s Baker House, Andy would either criticize my pin ball technique (which was both more colorful and productive than his) or berate my *Technology Review* problems as being too boring. It is interesting to note that I was the "star" of the Baker House pin ball column and his problems are the flop of Puzzle Corner.

30 A mathematician moonlighting as a census-taker stops at his friend's house. In this census he is required to obtain the names and ages of all the occupants of the house. After writing down several names and ages the census-taker asks, "Are there any more people who live here?" His friend replies, "Yes, there are three more people that live here." When asked for their ages, the friend reports that the product of the ages is 1296 and the sum is the street number of his house. The census-taker makes a few calculations and then says, "Just tell me one more thing: How many of the three are older than you are?" As soon as his friend replies, the census-taker smiles, writes down the ages, and leaves. What is the house number?

Major Frederick H. Cleveland submitted the following:

"The house number is 91. It is the only sum of the factors of 1296 that occurs more than once (2, 8, 81 and 1, 18, 72); hence the need for more information. Note also that his friend's age must be from 8 to 17 or 72 to 80, inclusive; 1 is a mathematical possibility but not very probable."

Also solved by William Dunbar, Captain Walter C. Moore, Russell A. Nahigian, Smith D. Turner, Captain John Woolson, and Messrs. Martin and Mays.

31 The diagram below shows the final position in a chess game in which White has checkmated Black. What was White's last move? His next-to-the-last move?

Black							
						WK	
					WP	BK	
						WP	BP
							WP
WP							
	WB						
White							

Captain Martin submits the following: White's next-to-the-last move was P to K5, to which Black responded with P to B4. White then claimed the pawn, giving the published position.

Also solved by: John L. Joseph, T. D. Landale, Alan Matthews, and Donald F. Morrison.

Better Late Than Never

9 Given the quadratic polynomial with matrix coefficients

$$P(Z) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + Z \begin{bmatrix} -3 & -1 \\ 14 & -11 \end{bmatrix} + Z^2 \begin{bmatrix} -4 & 4 \\ -58 & 28 \end{bmatrix}$$

Factor it. One solution is:

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + Z \begin{bmatrix} 2 & -1 \\ 20 & -7 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + Z \begin{bmatrix} -5 & 0 \\ -6 & -4 \end{bmatrix}$$

There are five other solutions.

Finally someone solved this. Eric E. Hovemeyer notes that: another factorization of

$$P(Z) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + Z \begin{bmatrix} -3 & -1 \\ 14 & -11 \end{bmatrix} + Z^2 \begin{bmatrix} -4 & 4 \\ -58 & 28 \end{bmatrix}$$

is

$$P(Z) = \left(\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + Z \begin{bmatrix} -4 & 0 \\ -4 & 3 \end{bmatrix} \right) \left(\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + Z \begin{bmatrix} 1 & -1 \\ 18 & -8 \end{bmatrix} \right).$$

15 Leslie R. Axelrod claims that 1729 is interesting since it is the first number which is the sum of two cubes in two different ways ($1729 = 1^3 + 12^3 = 9^3 + 10^3$).

Allan J. Gottlieb, who studied mathematics at M.I.T. with the Class of 1967, is a Teaching Assistant at Brandeis University. Send answers and problems to him at the Department of Mathematics, Brandeis University, Waltham, Mass., 02154.

Tech-Crostic

The correct solution to the Tech-Crostic on pages 94 and 95 of this issue of *Technology Review* is as follows:

"Unlike European metalwork which usually utilizes only the fluidity and workability of metals, Japanese metal work often reveals a deep feeling for the structure of metals and their chemical properties."—Smith, *A History of Metallography*.

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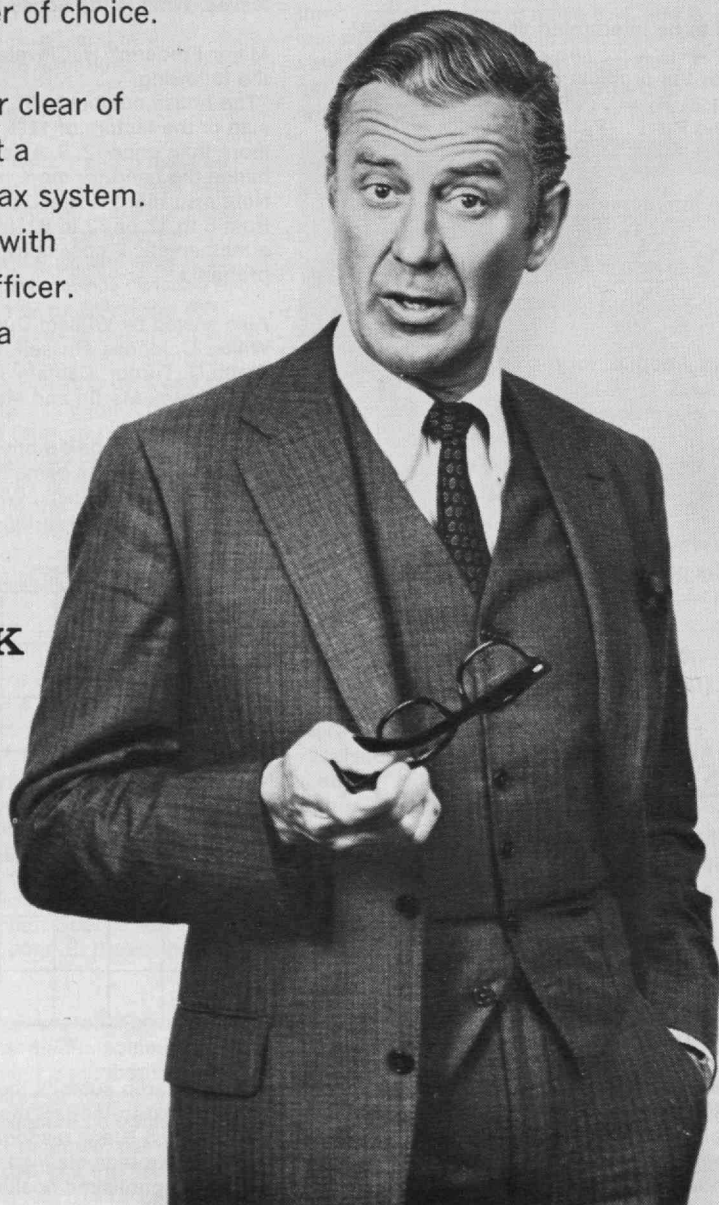
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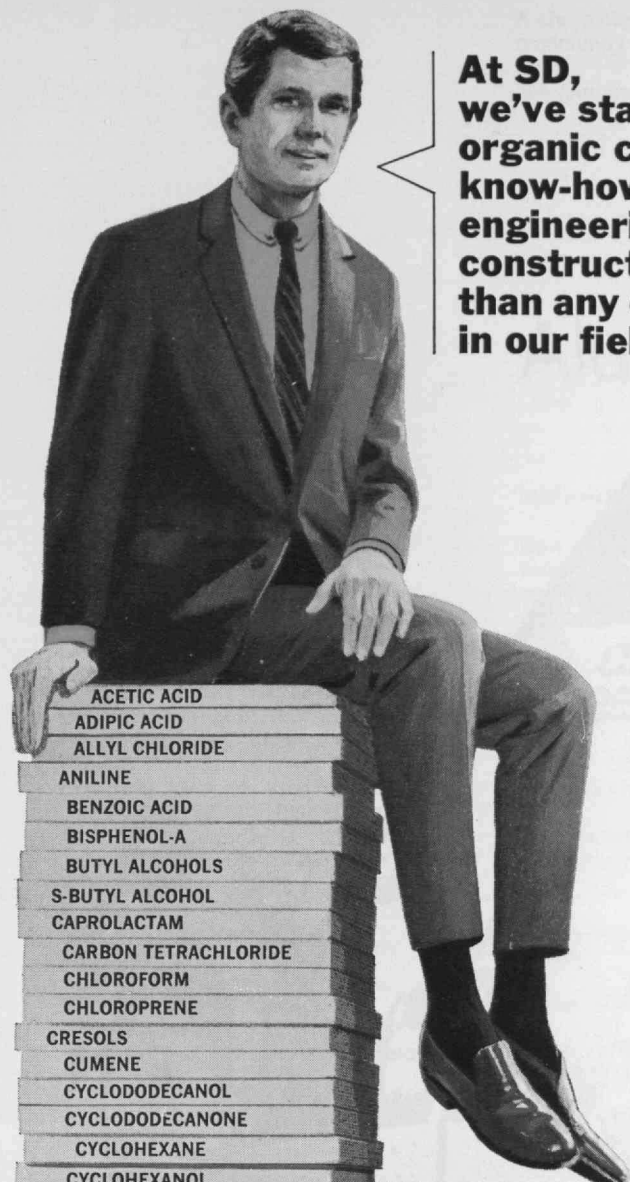
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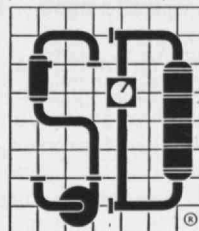


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ETHANOLAMINES	VINYL CHLORIDE
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ETHYLENE DICHLORIDE	P-XYLENE
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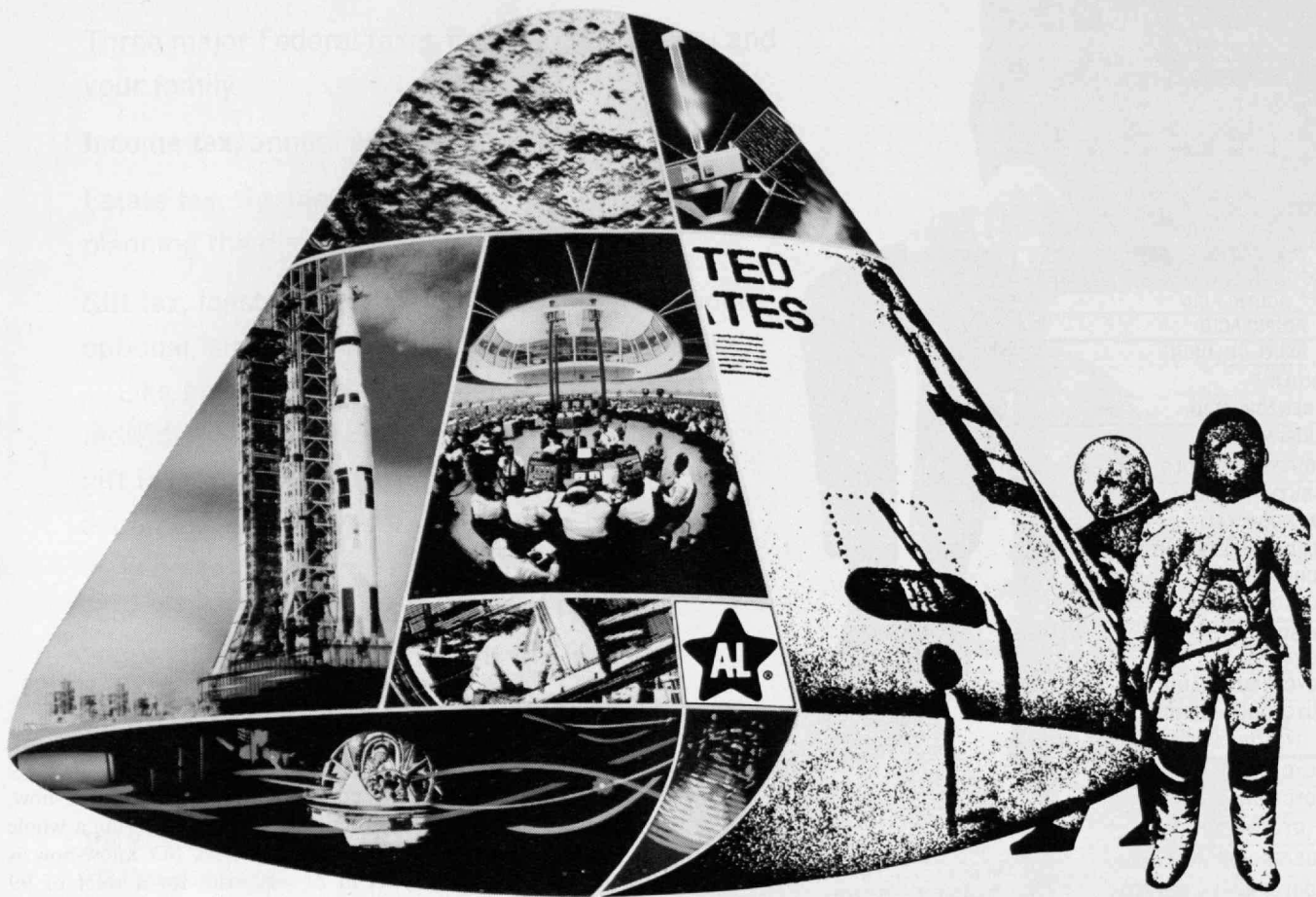
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Institute Review

Kissing '69 Good-Bye with Pomp and Ceremony

The most disruptive event during M.I.T. Commencement this spring—in a season full of disruptions on other campuses—was a kiss which one graduating co-ed gave the President when she received her diploma.

And, while disruptions on other campuses led to generally pessimistic interpolations about "what the younger generation is coming to" (by, of course, members of the older generation), M.I.T.'s kiss led to speculation that it is not youth which is becoming less attractive, but that college presidents—at least at M.I.T.—are becoming more so.

But for that slight interruption during the awarding of 1,139 degrees, this year's Commencement had all the pomp and beauty of the past. The ceremony in Rockwell Cage began with the procession of the Marshals, led by Chief Marshal Cecil H. Green, '23, President of the Alumni Association, the honored Class of 1919, some 60 of whose members returned for the occasion, the Corporation, the Faculty, and finally, the graduates.

Ceremonies were opened by James R. Killian, Jr., '26, Chairman of the Corporation, and by the Reverend Ralph N. Helverson of the First Parish, Unitarian, Cambridge. His invocation remembered that M.I.T. was a place where students came "to determine what is a fact . . . to know that what today is knowledge, tomorrow will be supplanted by new knowledge, and that what is truth now was once only imagined. . . ."

Highlights of the ceremony included the address by Howard W. Johnson, President, on the roles of students, faculty, and administration on today's campus (see below) and a short address by Francis W. Sargent, '39, Governor of Massachusetts, who touched on similar themes (see page 105). Also featured was contemporary music played by a brass choir—especially the *Festive Prelude*, written by William Grossman, '69 (who did not graduate; he will take both S.B. and S.M. degrees in 1970), and directed by John D. Corley, Jr., Assistant Director of Music.

Irwin W. Sizer, Dean of the Graduate School, presented the Goodwin Medal for teaching distinction to Harriet J. Fell of Flushing, N.Y., a Ph.D. candidate in mathematics who received her degree later in the ceremony. Dean Sizer described Miss Fell's career as a teacher in detail:

"She gives a class in freshman calculus between two and three in the afternoon. But at one o'clock, the students begin to pour into her office, and she helps them each and every one. Then they take a brief intermission for the class, and then they go on working, sometimes until dinnertime.

"She has changed the face of M.I.T. for all those with mathematical troubles," he said, "and she is one of the loveliest and friendliest people at M.I.T."

The awarding of the degrees proceeded normally—despite the heat—with only two unusual features. One was the now-famous kiss, initiated by Marilyn J. Tamm, '69, of Detroit, Mich., an S.B. candidate in metallurgy. The other was the presence of red armbands which were worn by some 90 of the 900 graduates present, and which symbolized the wearers' protest to the war in Vietnam. (Although the lawn was clear by the time ceremonies were underway, some of the students also planted 50 white crosses in front of the M.I.T. Chapel that morning, to remind visitors of the Vietnamese dead).

Toward Understanding and Responsibility in Activism

Howard W. Johnson, President of M.I.T.—making an "eleventh-hour plea for understanding and for tolerance"—told members of M.I.T.'s Class of 1969 at their Graduation Exercises that the human values "will intensify your learning and enrich your technical competence. In a broader sense," he said, "they will determine our course as a nation and yours as individuals."

There are two ways, President Johnson told the graduates, to make yourself heard. "The easier way is to shout; it is dramatic and it is temporarily expedient. But sooner or later you will be expected to produce some ideas to justify the commotion. And you

will be expected to do your share of listening.

"The other way to make your voice heard—the harder but more lasting way—is to be creative first and talk afterwards."

Power is not the issue, President Johnson declared—"it is not and should not be the purpose or province of a university." Instead, President Johnson told the graduates, "understanding is the real mark of a growing and learning person." Learning it is "the hardest test for all of us as individuals . . . We side-step the issue of understanding by accepting the 'generation gap,' for example, as irrevocable. But (such gaps) can be bridged . . . by the willingness to understand and develop new solutions.

"Separatism, intransigence from any side—these make the task of human unity so much more staggering."

M.I.T., too, has responsibilities, President Johnson told the graduates, of which the foremost are "the education of men and the development of knowledge," he said. "Each is important to us not because of how much we know but because there is so much that we do not know.

"Universities stand today right at the center of this dilemma of not knowing," President Johnson declared.

Before the universities is a "difficult task of transition—to deliver the universities from what is, to what will be, as we want it to be—to seek to reform our methods and our programs, and still to defend our institutions against internal and external attack.

"This will take commitment and responsibility from all of us," President Johnson said—including especially the responsibility "to be a model of rational debate.

"To those who urge reform but will not help defend the institution, I say that they deserve the ruin that will surely come. And to those who would defend but not reform, I would say the same thing."

"To those who urge reform but will not help defend the institution, I say that they deserve the ruin that will surely come. And to those who would defend but not reform," said President Howard W. Johnson at M.I.T.'s 103rd Graduation Exercises, "I would say the same thing."

In all, 1,139 degrees were awarded on June 13 in Cambridge—including one to Virginia A. Mai (a Ph.D. in chemistry). Dean Robert A. Albery of the School of Science called her name, and Walter A. Rosenblith, Chairman of the Faculty (left) and Irwin W. Sizer, Dean of the Graduate School, shared her obvious pleasure at receiving the coveted cardinal hood. Cecil H. Green, '23, President of the Alumni Association (lower left), presided.



R.O.T.C. Commissioning: Military and Executive Responsibility

Admiral Joseph C. Wylie, Commandant of the First Naval District (Boston), took the occasion of the Joint Commissioning Exercises which opened M.I.T.'s Commencement activities on June 12 to add perspective to the national debate on military vs. civilian supremacy.

The controversial decisions of the 1960's—Vietnam, A.B.M., defense budgets—have been made, not by the military, but by appointed officials in the executive branch of government, said Admiral Wylie. The dilemmas arise from the relationship between the legislative and executive branches, not from the military services, he said.

The 1948 act unifying the armed services and the 1958 reorganization act moved vast powers from the Congress to the executive branch of government, thus allowing appointed executives to make decisions which had formerly been made by elected representatives, Admiral Wylie declared. He pointed out to 31 seniors in the R.O.T.C. program that they took their oath of loyalty to the Constitution and not to a branch of the government. "The services are above politics, and in this lies the honor of the profession," Admiral Wylie said.

Assigned to photograph Professor John K. Galbraith (background, below) during the reception following his Senior Class Convocation address on June 12, Technology Review's photographer was understandably distracted—and so are the Editors. Later there were dancing and rejoicing with a faculty "combo" in the Student Center. (Photos: Richard M. Koolish, '68)



Of M.I.T.'s 31 R.O.T.C. graduates in the Class of 1969, 17 were sworn in as officers in the Army or Army Reserve, four as officers in the Naval Reserve, and 10 as Air Force officers.

The University's Enemies Are on the Right, Not the Left

"Those who talk most unctuously about violence (in cities and universities) are the least reluctant to unleash it. Before anyone asks us to listen to him concerning the wickedness of violence let him, henceforth, establish his credentials as an opponent of violence—both at home and abroad."

John K. Galbraith, who is Harvard's Paul M. Warburg Professor of Economics, was the speaker at M.I.T.'s Senior Class Convocation on Commencement Eve, and his topic was "One More Look at Our Current Troubles." The Kresge Auditorium was almost filled with graduates and their friends and families, and Dr. Galbraith invited them to share his sense of puzzlement at the "odd gallery of specialists" who are currently being heard on the subject of student unrest. He earned enthusiastic applause for remarking: "Any matter on which Strom Thurmond, John McClellan, Joe Alsop, Al Capp, Spiro Agnew, J. Edgar Hoover and Walter Annenberg are in solemn

agreement obviously has another side.

"I hear the instant educational sages . . . proclaiming that university faculties are to blame because they are permissive," said Dr. Galbraith. "To be permissive is to enquire whether the other person has a grievance. . . . Even if we find his behavior inconvenient or objectionable we do not immediately react by banging him over the head. We recognize that he is another human being with another point of view. Possibly he has another and even hostile sense of values. But even then our instinct is to permit, not deny. That is the instinct of civilized men. Let us be proud of that instinct. And especially in the universities."

Turning from the critics of universities to the universities themselves, he said, "In the United States the universities are the instruments of change—and they are, very nearly, the only instruments of change." This is why the present ferment is so concentrated in the universities; it is also why the universities are being attacked, from outside, by "the people who most dislike social change." But the latter should remember that the universities are not without influence. "I hope in 1970 that we can have a general and salutary assault on the political careers of all who are assuming that universities are an easy and harmless ob-



ject of political diatribe." However, this will be possible "only if we are not busy tearing ourselves apart."

So certain things must be upheld. "There must, in the university, be a tolerance of every reasonable and competently argued position—and there can be no physical or other disruptive barrier to that argument. That holds for Herbert Marcuse; it holds for Walt Rostow . . . for Marx and Herbert Spencer and Vilfredo Pareto if their return can be arranged, and most definitely for Mao Tse-Tung if leave of absence can be managed. Only those may be excluded who insist by physical means on reserving the right of speech to themselves, and even that rule must be applied with restraint." There are few rules in life that have been truly learned; this is one, he said.

Dr. Galbraith had just returned to Harvard after an absence of some months, and he was "struck by the gloom that pervades the modern university community. It is a widely held view that Harvard is tottering on the brink; one slight further nudge and it will tumble into the Charles."

But, he said, universities are going to survive, partly because the modern industrial community cannot survive without them, and partly because the people

in them are in fact able to survive "a little strife. Engineers, we know, are not all that sensitive. Neither are economists. Perhaps not even modern poets. So let us be of reasonably good cheer. All is not over yet."

And, to the departing class, Dr. Galbraith offered the following advice: "You have sought, not without success, as undergraduates to be a source of radical pressure on your university. Now you must do something really difficult and promote a similar pressure from the alumni."

"Mr. Nixon Doesn't Understand"

"Each of you is a center of power," President Richard M. Nixon wrote to Mark J. Mathis, President of the M.I.T. Class of 1969; "but all power must be tempered with compassion."

"Students today seem to speak without talking and hear without listening," wrote Mr. Nixon. "But you will be measured not by the quality of your rhetoric but by the goal of your lives."

Speaking for his class at the Commencement Luncheon following graduation ceremonies at M.I.T. on June 13, Mr. Mathis—who is the only president the Class of 1969 has ever had, having been re-elected as president ever since his

freshman year—said: "But Mr. Nixon leaves a negative impression. . . . He does not really understand the question we have asked."

Mr. Mathis used a quote of George Bernard Shaw, which was used by Robert F. Kennedy, to explain what he saw as the real question: "Some people dream things that are and ask why. I dream things that never were and ask why not." After four years of feeling frustrated because they could not make a full contribution to national problems, the M.I.T. Class of 1969 is finally on its own, said Mr. Mathis. As M.I.T. graduates, now "we seek the right answers to the right problems which now face our country."

Building the Future on the Past

"Your quest for excellence . . . is the greatest creative force in America," Francis W. Sargent, '39, Governor of Massachusetts, told the M.I.T. community at the Graduation Exercises on June 13. "Today's students," he said, "are our most special breed—the best educated, the most worldly, the most demanding in history."

In asking for excellence in our society, said Governor Sargent to the new M.I.T. class, "your demands are not excessive,

The principals in M.I.T.'s 1969 Graduation Exercises (left to right): Francis W. Sargent, '39, Governor of Massachusetts; Howard W. Johnson, President of M.I.T.; Cecil H. Green, '23, President of the Alumni Association; Vannevar Bush, '16, Honorary Chairman of the Corporation, and James R. Killian, Jr., '26, Chairman of the Corporation. (Photo: Boston Herald Traveler from Robert R. Shrock)





J. A. Champy, '63



Elisha Gray, '28



W. R. Hawthorne,
Sc.D.'39



J. H. Holland



B. M. Kerr, '51



Eugene McDermott

though your methods sometimes are and your rhetoric often is."

And, he said, "you are right to hurry, for the hour is late in America and the wind of change is rising."

But "we cannot have a better America by wrecking a troubled America," Governor Sargent warned. "Your quest for excellence . . . must be channeled into America's mainstream, for . . . we can build tomorrow only on the foundation of the past, not on the rubble of ruined institutions."

Class of 1919: Reminiscence

It was different 50 years ago, Eugene R. Smoley, Secretary of the 50-Year Class of 1919, told the Commencement Luncheon audience at M.I.T. on June 13. Looking around the festive tents in M.I.T.'s Great Court, adorned with long-haired graduates and mini-skirted guests, Dr. Smoley smiled. "We dressed differently," he said. "We wore derbies, stiff collars and shoes."

"And you could easily tell a male from a female." But dress doesn't make a man, he admitted.

And "what a great 50 years you have ahead of you," he told the Class of 1969.

Fifty years ago, he said, he predicted the arrival of television—but surely not that it could bring us pictures in full color made by men 10 miles above the moon. Now Dr. Smoley has stopped making predictions—recognizing simply that it has been a "privilege to be part of the phenomenal achievements of the past 50 years."

New Corporation Members

Nine new members have been invited to join the M.I.T. Corporation, the Institute's board of trustees, according to James R. Killian, Jr., '26, its Chairman. Of eight alumni listed by Dr. Killian, four have been chosen by members of the Alumni Association in their 1969 annual national ballot.

The new Corporation members chosen for five-year terms by alumni are:

Breene M. Kerr, '51, management consultant, Oklahoma City. Carl M. Mueller, '41, Partner in Loeb, Rhodes and Company, New York. Harold E. Thayer, '34, Chairman of the Mallinckrodt Chemical

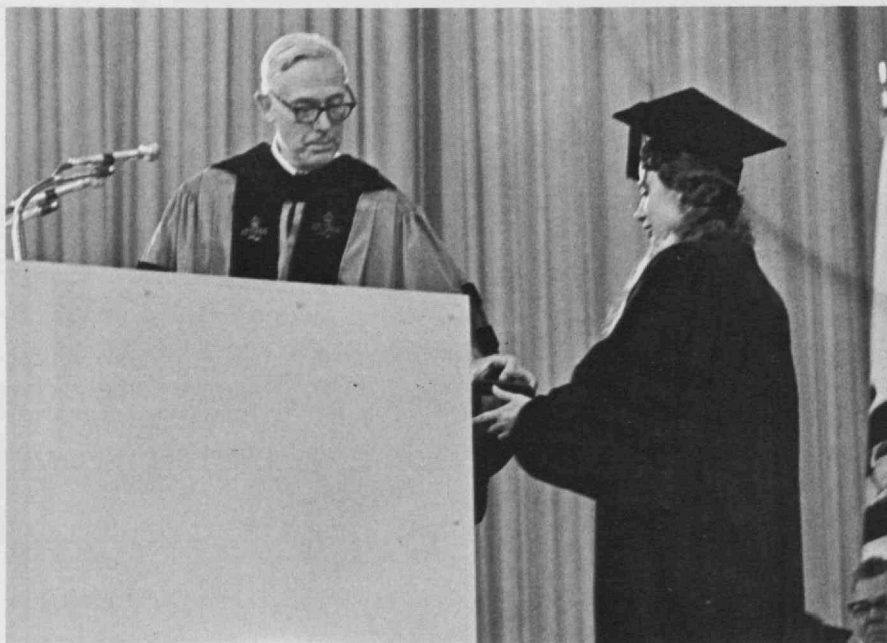
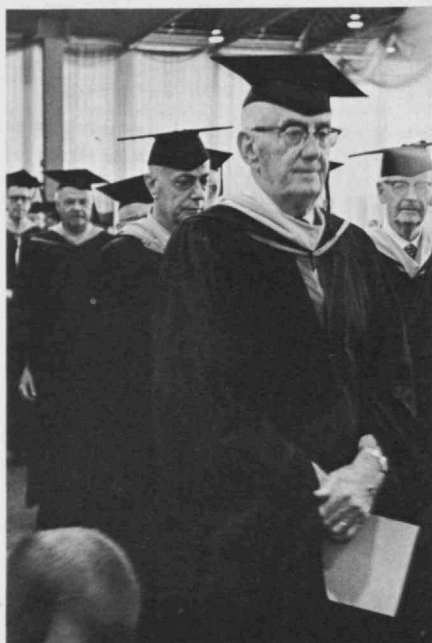
Works, St. Louis.

In addition, Philip H. Peters, '37, Senior Vice President of the John Hancock Mutual Life Insurance Company, Boston, joins the Corporation as an *ex-officio* member upon assuming the office of President of the Alumni Association on July 1.

Other term members of the Corporation whose election was announced by Dr. Killian include:

James A. Champy, '63, attorney and civil engineer associated with the Champy Construction Company, Lawrence, Mass. Elisha Gray, 2d, '28, Chairman of the Board of Whirlpool Corporation, St. Joseph, Mich. William R. Hawthorne, Sc.D.'39, Master of Churchill College, Cambridge University, England. Jerome H. Holland, President of Hampton Institute, Hampton, Va. Jephtha H. Wade, '45, attorney of Boston.

Dr. Killian also announced that Eugene McDermott, Director of Texas Instruments, Inc., Dallas, Tex., whose Term Membership on the Corporation expired in June, has been elected a Life Member.





C. M. Mueller, '41



P. H. Peters, '37



H. E. Thayer, '34



J. H. Wade, '45

The Schultz Teaching Award

Baird-Atomic, Inc., of Cambridge has given 1,000 shares of its common stock to M.I.T. for the establishment of the Baird-Atomic Fund. Income from the fund will be used for an annual David T. Schultz Award for Excellence in Teaching in Electrical Engineering, honoring Mr. Schultz, Chairman of the Executive Committee of Baird-Atomic.

In accepting the gift, Joseph J. Snyder, '44, Vice President and Treasurer of M.I.T., said: "Education is the foremost concern at M.I.T. and the officers of Baird-Atomic have recognized this in making their handsome gift for the encouragement of good teaching." Louis D. Smullin, Head of the Department of Electrical Engineering, said that according to present plans an award will be given each year to a member of the teaching staff, probably an instructor or assistant professor, for outstanding accomplishment in teaching undergraduates.

Influence with Ambiguity

The "enormously increased" influence of universities and the special position of the college newspaper within them leaves

the campus editor in a difficult and ambiguous position: He is trying to cover events—supposedly objectively—to which he must himself be personally committed.

By virtue of his position, the editor has a special involvement in lots of campus affairs, said Robert Reinhold, Cambridge correspondent of the *New York Times*, at this spring's annual banquet of *The Tech*. So he sees them differently—from a special point of view.

And sometimes he must know things about the campus that he cannot print—a conflict of interest, added Steven C. Carhart, '70, Editor of *The Tech*.

Under these conditions, can a college paper be wholly objective in covering the news? asked James R. Killian, Jr. '26, Chairman of the M.I.T. Corporation, who was Editor of *The Tech* 42 years ago.

No, said Mr. Reinhold. But that is not the problem, he said. "College papers have a great opportunity to be more aggressive." The mere fact that the college editor is pushing into a story "is itself important and influential," said Mr. Reinhold. Indeed, he said, a paper can "harden and

change events even without expressing opinion as such."

Eloranta Fellowships

Three juniors are now at work under M.I.T.'s first Peter J. Eloranta Fellowships for summer research in a university, government, or industrial laboratory of their own choosing.

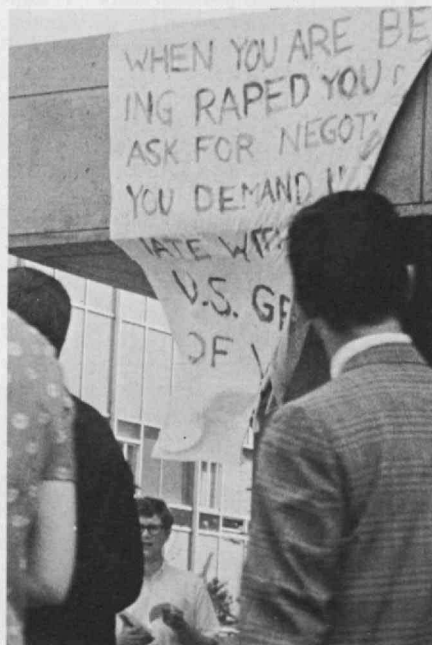
They are: Kenneth Dill, '70 who will work on the relationships between oxygen concentration and gas exchange in the human lungs at the University of London; Charles Swanson, '70, who will investigate regulation of a bacterial virus infection with Dr. David Botstein, M.I.T. Instructor in Biology; and Marc Tiper-mas, '70, who will make a case study of public policy with regard to the possible installation of a nuclear power plant in Ipswich, Mass., under Harvey M. Sopol-sky, Assistant Professor of Political Science at M.I.T.

M.I.T. Studies Gout

A two-year study of the effects of diet on the occurrence of gout will be conducted by the M.I.T. Department of Nutrition and Food Science under a grant of \$193,156 from the John A. Hartford Foundation, Inc.

The study will focus on inherited defects which are the basis of gout, especially on purine, which relates to the disease by virtue of the fact that it is not only a major component of the genetic materials DNA and RNA, but also converts to uric acid by normal bodily processes. Failure of the breakdown of uric acid by the body is associated with the occurrence of gout.

The study will investigate genetic aspects of the disease and the secondary gout produced by diets rich in purines; and it will seek a rapid screening procedure for identifying gout-prone persons.



Commencement 1969—at once traditional and different. At the far left, the traditional: the 50-year Class of 1919 marching proudly in the academic procession, and Harriet J. Fell, a Ph.D. candidate in mathematics, receiving the coveted Goodwin Medal for effective teaching from Irwin W. Sizer, Dean of the Graduate School. On this page, the mildly unconventional: a banner unfurled from the Student Center balcony above the heads of waiting Graduation guests, and the red armband signifying opposition to the Vietnam war—worn, observers estimated, by a few less than 10 per cent of the graduates.

academic aspects of Institute life," according to President Johnson.

J. Daniel Nyhart, Associate Professor of Management, becomes Dean for Student Affairs, reporting to the new Dean for Institute Relations. "In addition to operational responsibilities in directing the functions and services of the Office for Student Affairs," said President Johnson's announcement, "Dean Nyhart will devote his attention to the broader aspects of formal and informal education and to developing and strengthening relationships among faculty and students."

Of Professor Wadleigh's service as Dean of Student Affairs for eight years, President Johnson said in a letter to the faculty that "through his effective protagonism the interests of students and faculty alike were advanced and the living environment for students at the Institute improved. We are all in his debt," the President wrote.

The new M.I.T. Vice President joined the faculty in the Department of Mechanical Engineering in 1949, having interrupted his graduate study in that field to serve with the National Advisory Committee on Aeronautics during World War II. In 1952, while in charge of the Department's Heat Power Laboratory, he received the Institute's Goodwin Medal for "conspicuously effective teaching."

Dr. Snyder came to the M.I.T. Medical Department from Wellesley College in 1959; three years later he embarked with John T. Rule, '21, then Professor of Engineering Graphics, on a long-range study of the interaction between students and the Institute the full report of which is now being completed. Dr. Snyder studied at Bard College, Columbia University, the University of Pennsylvania, and New York University; he interned at the University of Chicago Clinics and was a resident in psychiatry at Cincinnati General Hospital.

Dean Nyhart's professional work has centered on the role of law in the economic development of emerging nations, especially in Africa. He spent two years in Uganda and Nigeria just before joining the M.I.T. Sloan School of Management in 1960, and he has been active in development and foreign student projects as a member of the M.I.T. faculty. Professor Nyhart studied at Princeton University (A.B., 1953) and at the Harvard Law School (LL.B., 1958), and he is a member of the American Bar Association.

From Metarock to Repertoire: Making a Radio Station "Great"

Can a campus radio station—ill equipped, operated by amateurs in their spare time, and surrounded by a dial full of professional radio—find a useful place in campus and community communications?

WTBS, the M.I.T. student AM-FM station, thinks so and is out to prove it.

The staff of WTBS has literally hauled

itself out of oblivion in the past six months. At the beginning of 1969 the station was broke, the staff small and demoralized. Arnold E. Amstutz, '58, Associate Professor of Management who is Chairman of the WTBS Foundation, the organization of faculty and alumni which serves as a "board of trustees" for the station, came to the rescue with a special seminar (academic credit was given) in management principles. His lesson: look first at the objectives, then look at the resources, then look at the alternatives. Develop the station's operations so that people share goals and work toward them. When resources are so limited, spend them where it counts most for people—spend them for programming, not for hardware.

Now R. Brough Turner, '71, General Manager, guesses that at least 50 students each work at least several hours a week for WTBS: he himself spends 30 hours a week. Its programs go through "restricted radiation" systems into the dormitories by AM and to Greater Boston on 88.1 FM under a non-commercial broadcast license.

Jazz, "Rock," Bach, and Apollo

Most of the station's air time (7 to 10 a.m. and 5 p.m. to 2 a.m. on most weekdays) is devoted to music—some "live," most recorded—"rock," "soul," jazz, classical, "bluegrass." In one week this spring the musical offerings included two hours of the music of Bach, a special program on Al Jolson, music of the East, "jazz at midnight," "metarock microcosm," and a special series on the music of war through the ages. Two years ago WTBS was the first Boston station to play programs of "progressive rock," and more recently there have been both broadcasts and concerts of avant-garde jazz.

In addition, there are "specials"—a weekly "Topics in the News" analysis show written by 11 freshmen and three sophomores who go on the air every Sunday evening, daily national and campus news reports, direct broadcasts from the stage of Kresge Auditorium and occasionally from other campus locations, and very occasionally special programming such as direct "live" coverage of the Apollo launches by tape and wire from Cape Kennedy.

The future presents problems—and opportunities, says Mr. Turner.

As usual, most of the problems could be solved with money. Much WTBS equipment is old, kept in operation only by the ingenuity of the WTBS service staff. Professional-quality tape equipment is at the top of the wanted list.

The transmitting antenna is on the roof of Walker Memorial, which was a fine location until construction of the Green Building put a concrete and steel shield between WTBS and its Harvard-Square-area audience (including some of the principal WTBS staff). Now the station wants to move its antenna to the top of Eastgate, which would give its FM



Benson R. Snyder J. Daniel Nyhart

Special Projects, Communications, and Student Affairs

Three major administrative appointments in the fields of community and student affairs become effective at M.I.T. this summer.

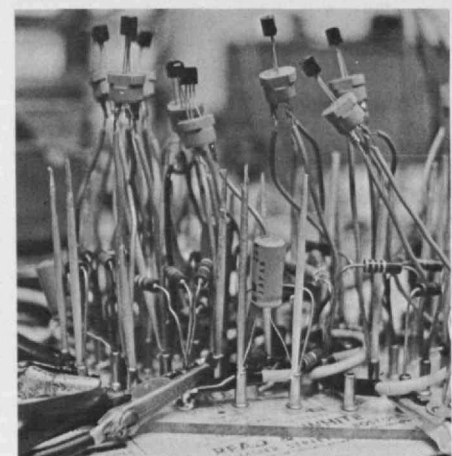
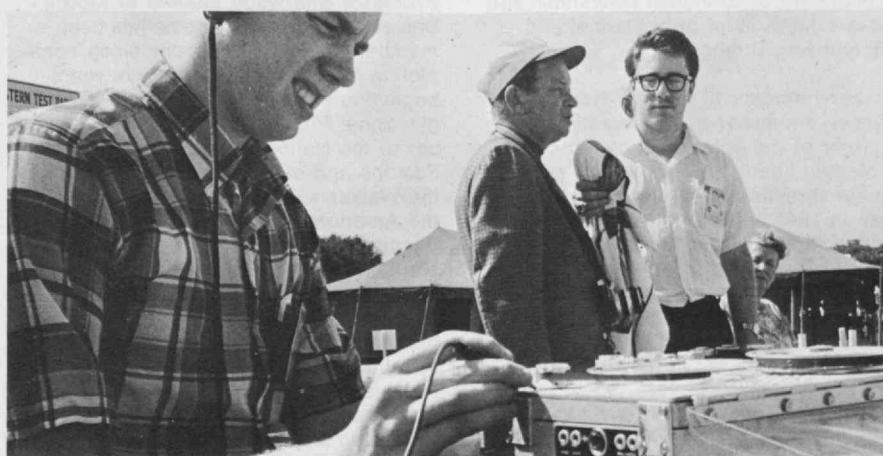
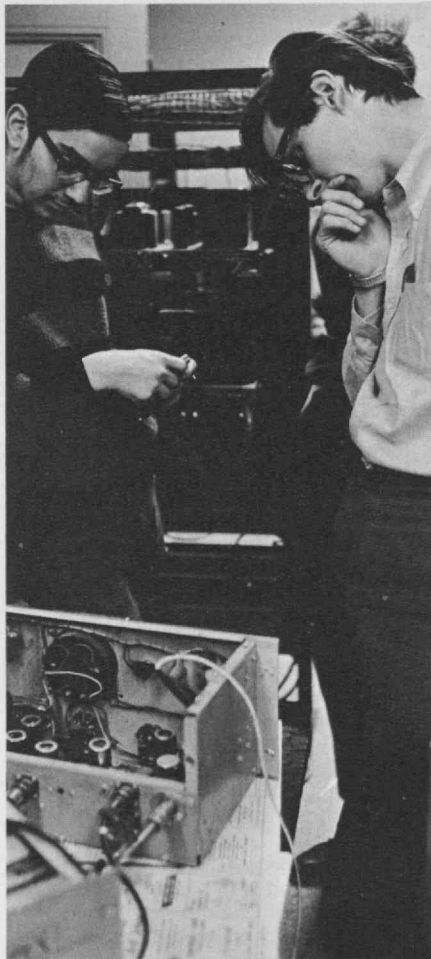
Kenneth R. Wadleigh, '43, who has been Dean of Student Affairs since 1961, becomes Vice President of M.I.T. on July 1. President Howard W. Johnson said he will "take on special projects of major interest to the Institute."

Dr. Benson R. Snyder, Psychiatrist-in-Chief of the M.I.T. Medical Department, assumes a new post of Dean for Institute Relations, where he "will devote his attention to the improvement of communications and cooperation among all parts of the Institute—faculty, students and staff in both the academic and non-

Kenneth R. Wadleigh, '43



By almost any standard, the equipment and studios of WTBS, M.I.T.'s student-operated AM-FM radio, are inadequate—even primitive. As a result, operations are complicated, training is difficult, and repairs (and breadboard contraptions) common. But R. Brough Turner, '71, General Manager, takes a positive view: there's no place to go but up . . . including such special programming as an interview (below) with John ("Shorty") Powers, who won fame as the "voice" of Project Mercury, during WTBS coverage of an Apollo launch at Cape Kennedy. (Photos: Richard M. Koolish, '68, George J. Flynn, '69, and David Laing, '70)



signal a clear view of most of the Greater Boston area inside Route 128.

A Creative Voice for M.I.T.

What next for WTBS? Commercial radio stations today are second-rate media, says Mr. Turner; no one takes them seriously enough to invest in really good programming. He wants to make WTBS different—a truly creative voice for M.I.T.

Already there's a new system for screening programs before they go on the schedule. The would-be producer must make a formal proposal, including a pilot tape, of the series he wants to do. Then the Program Director talks to the producer and listens to the tape before he qualifies the show. "Above all," says Mr. Turner, "we're looking for originality. We want to keep the door open for experiments on the air."

Could an M.I.T. student prepare a radio program instead of a term paper, for credit? Could WTBS sponsor and broadcast its own repertoire drama company? What about some good science news broadcasting? And more interviews with more of the important people who every day travel to and from the M.I.T. community?

All of these things are in Mr. Turner's mind when he told the WTBS Foundation this spring, "We're here to produce a great radio station."

Retirement Comes to Twelve Distinguished Teachers

Twelve members of the M.I.T. faculty, many of whom will be remembered by students in more than 40 M.I.T. classes, retire from full-time teaching this summer. They "exemplify for us the goals of the Institute and its devotion to teaching and scholarship," wrote President Howard W. Johnson to members of the faculty this spring.

The twelve are:

Douglass V. Brown, Alfred P. Sloan Professor of Management
Cecil G. Dunn, '30, Associate Professor of Industrial Microbiology
Billy E. Goetz, Professor of Management
Robert S. Harris, '28, Professor of Nutritional Biochemistry
Lawrence J. Hiedt, Associate Professor of Physical Chemistry
Yuk-Wing Lee, '27, Professor of Electrical Engineering
Kurt S. Lion, Associate Professor of Applied Biophysics
Philip M. Morse, Professor of Physics
Norman J. Padelford, Professor of Political Science
Francis O. Schmitt, Institute Professor of Biology
Thomas K. Sherwood, Sc.D.'29, du Pont Professor of Chemical Engineering
Cyril S. Smith, Sc.D.'26, Institute Professor; Professor of the History of Science and Technology; Professor of Metallurgy

Professor Brown came to M.I.T. in 1938 after completing degrees at Harvard and

serving six years on the faculty of the Harvard Medical School; since then he has worked continuously in the field of industrial relations, teaching undergraduates, graduate students and post-graduate groups, consulting with industry and labor, and serving as labor arbitrator. He was Visiting Professor of Industrial Relations at the University of Chicago in 1959-60 and Acting Associate Dean of the M.I.T. Sloan School of Management in 1964-65.

The industrial aspects of utilizing bacteria, yeasts and molds have occupied Professor Dunn since before he completed work for the Ph.D. from M.I.T. in 1934. He was then for four years Research Associate in biology and public health before joining the faculty; and since then he has become a recognized authority in the field as teacher, author and editor.

Before coming to the M.I.T. faculty in 1954, Professor Goetz had varied experience in academic and industrial work. He studied at the Chicago School of Business and later at the University of Chicago; taught at the University of Chicago, University of Buffalo, Illinois Institute of Technology, American University, and Antioch College (Chairman of the Department of Business Administration, 1945-53); and was associated with James O. McKinsey and Company and Sessions Engineering Company. His professional activities center in the field of managerial planning and control.

After making important contributions to general nutritional studies, Professor Harris has turned in recent years to oral sciences, studying food and nutritional factors involved in disorders of the mouth. He has been on the M.I.T. faculty since receiving his Ph.D. in 1935 and for many years worked on nutrition problems in Latin American countries—serving as Scientific Director of nutrition laboratories in Ecuador and Cuba in the 1950's.

Lawrence J. Heidt has focused his teaching efforts on first-year and other undergraduate courses in physical chemistry. In addition, he has carried on important fundamental physico-chemical studies of photochemical reactions, visible and ultraviolet light absorption, actinometry, solar energy conversion and the mechanisms of both thermal and photochemical reactions.

An early student of the late Norbert Wiener, Professor of Mathematics and founder of the science of cybernetics, Professor Lee is best known for research on the statistical theory of communication. In 1947 he offered the first graduate course in this field in the M.I.T. Department of Electrical Engineering. Dr. Lee studied at M.I.T. for seven years beginning in 1923 (S.M.'28, Sc.D.'30), taught at institutions in Peking and Shanghai, and came to the M.I.T. faculty in 1946.

Kurt S. Lion was born in Germany and studied at the Technical Institute in

Darmstadt; he came to M.I.T. in 1947, following teaching assignments in Darmstadt, Istanbul, and Fribourg (Switzerland), to develop teaching and research programs in the application of physical research methods to biology and medicine. He has since gained distinction especially for applications of electrical science and instrumentation in the life sciences.

In 38 years at M.I.T., Professor Morse has been director of the Computation Center (1955 to 1967) and Director of the Operations Research Center (1958 to date), Scientific Director of Associated Universities, Inc., operating Brookhaven National Laboratory (1946-48), and Research Director of the Weapons Systems Evaluation Group of the Joint Chiefs of Staff (1949-50). He was one of the founders of the science of operations research and of the professional societies serving that field; he followed early newspaper and writing experience by serving from 1936 to 1946 as Associate Editor of *Technology Review*.

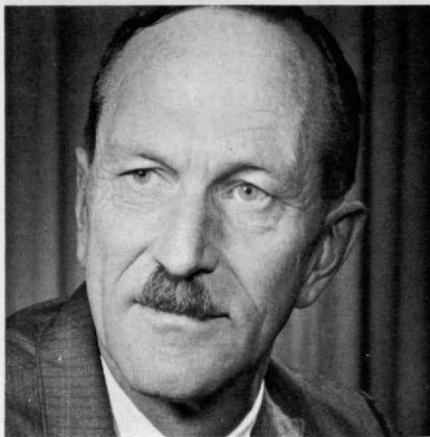
Professor Padelford joined the M.I.T. faculty in international relations in 1945, and he served as Chairman of the Institute's Political Science Section for several years beginning in 1955. Previously he had studied at Denison and Harvard Universities and taught at Harvard, Radcliffe, Colgate, and the Fletcher School (Tufts). His recent research has been on matters pertaining to the United Nations and other intergovernmental agencies.

Professor Schmitt came to the Institute in 1941 to develop teaching and research programs in molecular biology, now a central focus of work in the Department of Biology. In 1962 he organized the Neurosciences Research Program, a unique "invisible college" designed to bring scientists from many fields together for studies of the physicochemical and biophysical bases of mental processes. He was Head of the M.I.T. Department of Biology until 1955, when he became one of M.I.T.'s first Institute Professors.

A distinguished chemical engineer, Professor Sherwood was named to the Lamont du Pont Chair at M.I.T. in 1966; he is an authority on mass transfer under molecular and turbulent flow conditions. Professor Sherwood studied at McGill University and M.I.T., and he has been a member of the M.I.T. faculty since completing his Sc.D. degree; for six years beginning in 1946 he was Dean of Engineering. Professor Sherwood is a member of the National Academies of Science and of Engineering, and he holds the Walker and the Founders Awards of the American Institute of Chemical Engineers as well as the U.S. Medal for Merit.

Professor Smith's scholarship covers a broad range from topics in physical metallurgy to the historical interaction between science and technology. Following graduate work at M.I.T., he was with the

Continued on page 115



Douglass V. Brown
Alfred P. Sloan Professor of Management

I welcome this opportunity to say a word about Doug Brown. His influence on me, as on so many others, has been and is a great and good one. His "students" are legion and include all manner of associates at M.I.T. and outside the Institute's formal boundaries as well as the students of his students of his students. When people speak of the multiplier effect of a great teacher, they must have Doug Brown's in mind and in view.

Two aspects of Doug's character and pattern of behavior are especially noteworthy just now.

He has great respect for the individual person. This begins with self respect and continues to an acceptance of honestly held differences in views. Doug will argue but never try to force his views on anyone else.

He is the same guy—over time, in different places and among different people. Doug is Doug. He is himself. Long before the idea was discovered by the current "young generation," Doug had been doing his own thing. And a wonderful thing it has been and is.

—George P. Shultz, Ph.D.'49
Secretary of Labor



Cecil G. Dunn, '30
Associate Professor of Industrial Microbiology

Cecil G. Dunn is known by generations of M.I.T. students as an excellent teacher of the practical aspects of microbiology. His lectures are always extremely well prepared and well illustrated. Together with the late Dean Samuel C. Prescott ('94), under whom he studied, Professor Dunn wrote the first definitive text in industrial microbiology which has now gone through three editions and has been translated into a number of foreign languages. During the past five years—as Graduate Registration Officer of the Department—Professor Dunn has been extremely close to our graduate student group.

Indeed, the greatest single attribute of Cecil Dunn's career has been his ability to reach students—to understand them and to help them.

—Samuel A. Goldblith, '40
Professor of Food Science, M.I.T.



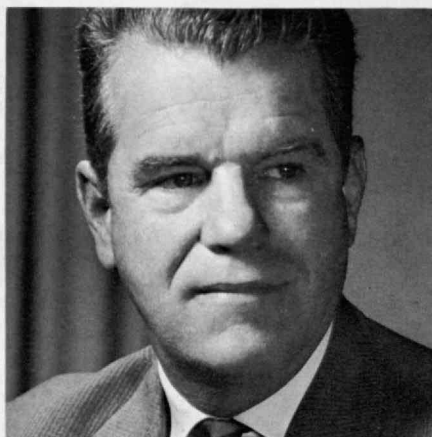
Billy E. Goetz
Professor of Management

Professor Goetz's vita is the record of a life devoted to the development of management as a profession, and to the improvement of management practices. First and foremost, it shows Goetz as the university professor, training young men for careers in business and management. But it also shows him as the industrial consultant, working directly with managers to achieve efficiency; and it shows him as the active participant in management societies, working to raise standards and disseminate information.

What Goetz's vita does not show, however, is his force in the promotion of better management. When I first met him—I was then a Boy Scout of fifteen—he was actively promoting a training program for patrol leaders. He was then and still is a critical and original thinker—never content with paying lip service to a good idea, or with accepting theories and practices merely because they are popular. In the classroom, he always approaches his subject—whether accounting or production management—from the standpoint of its relevance to the manager and his problems, and he insists on pursuing the theme of relevance through from beginning to end. Writers of orthodox accounting books, Goetz complains, always feel impelled to introduce accounting as a tool of management on page 1; then, after perfunctory performance of this duty, they relax into complacency, and neglect accounting as a tool of management for the remaining 800 pages. His own book, Accounting in Action (jointly with F. R. Klein), is thoroughly unorthodox; is not only pursues the relevance of accounting to management throughout, but also the relevance of accounting to everyday life.

Though retiring officially from M.I.T., Professor Goetz is not retiring from management education. He expects to continue part-time teaching, and also writing. He will, of course, maintain his critical approach, taking nothing for granted.

—David Durand
Professor of Management



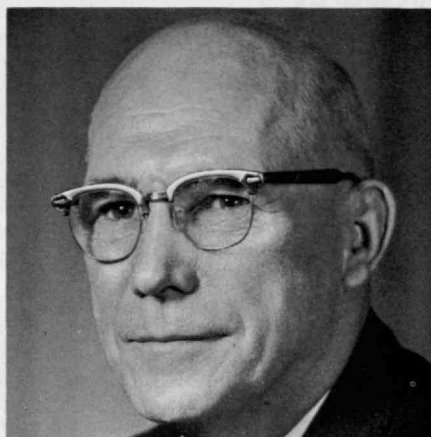
Robert S. Harris, '28
Professor of Nutritional Biochemistry

The contributions of Professor Robert S. Harris to his colleagues and students during his tenure at M.I.T. will be long remembered. They reach far beyond the confines of M.I.T. or New England or even the United States. His ability to appreciate problems and perceive needs in global nutrition and to aid in their alleviation by planning effective programs is manifested in numerous countries. He possesses a unique ability to polarize people with diverse interests and capabilities around an idea and to provide them with the stimulus to make the programs successful. Above all, he has had the interest of his fellow man at heart, particularly in problems of foods and nutrition, and has made significant contributions through research and writing toward the betterment of the lot of the people, particularly those in developing countries.

To the bewildered student or new faculty member entering the M.I.T. community for the first time, nothing is so welcome and reassuring as a friendly smile and a warm handshake. The amiable countenance and soft conversation of Professor Harris have been a refuge for innumerable foreign as well as native students and new faculty members coming to M.I.T. during the past 30 years; he especially has an empathy for students, and the enormous effect of Bob's efforts is manifested by the large number of friends at home and abroad.

Professor Harris will continue to exert a good and forceful influence on departmental and Institute affairs long beyond his retirement, and his colleagues view his semi-retirement with a smile in one eye and a tear in the other.

—Paul M. Newberne
Professor of Nutritional Pathology, M.I.T.



Lawrence J. Heidt
Associate Professor of Physical Chemistry

When Professor Heidt retires from his teaching position at M.I.T., he will leave a particular legacy of devotion to his students, both undergraduate and graduate. On the undergraduate level, over and above the usual class instruction, he has supported enthusiastically the freshman seminars, pointing out that students, electing to participate in a seminar, were given an opportunity to pursue their own special interests in science, engineering or other fields from the very start of their higher education. Thus a freshman, from his first days, found himself in close contact with a staff member, as contrasted with the more formal relationship in a class of twenty to twenty-five other students. Professor Heidt found this situation very stimulating to both teacher and student. His seminars in photochemistry were directed towards the identification of the intermediates in a reaction series and evaluating their contribution to the reaction as a whole.

Dr. Heidt's scientific interests have centered chiefly about the influence of light energy on chemical transformation—for example, the conversion of ordinary cane sugar, sucrose, and water into colorless sterile invert sugar solutions especially suitable for intravenous feeding.

Reporting on his researches carried him twice around the world in 1963, first January to March, when he lectured in Japan, Taiwan, Hong Kong, Manila, Bangkok, New Delhi, Tel Aviv, Jerusalem, Rome, Milan, Paris and London; the second world tour, April to August, saw him in New Zealand, Australia, Singapore, Beirut, Cairo, Athens, Istanbul, Rome, Vienna, Helsinki, Stockholm, Uppsala and Oslo. These extended trips, giving him personal contact with chemists the world around, greatly enlarged his view of the role of chemistry in the affairs of mankind and gave him a widened background in relating science to his students.

—Avery A. Ashdown, Ph.D.'24
Professor of Chemistry, Emeritus



Yuk-Wing Lee, '27
Professor of Electrical Engineering

Today all electrical engineers are aware of the discipline of network synthesis, although few know that it was the Sc.D. thesis of Professor Lee that formally introduced this topic and, as far as I can determine, coined the term. All electrical engineers also know that the real and imaginary parts of impedance functions are related by Hilbert transforms, but few know that the discovery of the relation and the application of Hilbert transforms to describe them was the original work of Professor Lee. It was Professor Lee who first introduced at M.I.T. an engineering subject called "Statistical Theory of Communication" based upon the mathematical work of Norbert Wiener. That subject has since become a basic ingredient of electrical engineering curricula. The contributions of Professor Lee on the detection of periodic signals in noise form the basis of modern radar distance-measuring techniques.

With so many technical contributions that have stood the test of time, it is indeed unusual that the same person has matched, if not exceeded, these achievements by his contributions to his students.

Professor Lee's teaching career in China was interrupted by a wartime experience in Shanghai that would have embittered many; but from it Professor Lee returned to M.I.T. with an increased strength of character, a will to excel in teaching and research, and an appreciation for many factors of life that most of us take for granted. In the years that followed he has worked closely with many graduate students and has placed great emphasis upon the development of their attitudes and character. Perhaps the feeling of his students can best be expressed by noting that there are many of us who are as proud to have studied under Professor Lee as we are to have studied at M.I.T.

—Amar G. Bose, '51
Professor of Electrical Engineering



Kurt S. Lion
Associate Professor of Applied
Biophysics

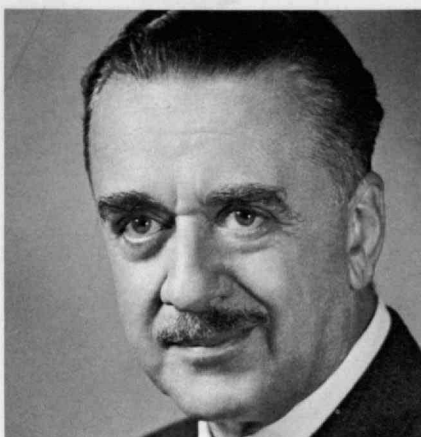
Professor Kurt S. Lion was one of the very first appointments to be made in biological engineering as it was just being established in the M.I.T. Department of Biology. It soon became apparent that the students interested in biological engineering had an abysmal knowledge of physical instruments, and to fill this void Professor Lion developed his now-famous course in instrumentation. By "bread-board" techniques employing circuit diagrams and electronic elements he was able to bring students to a sophisticated understanding of complex instruments in a relatively short period of time.

Over the years, Professor Lion's instrumentation courses have come to serve a wide clientele of students plus a large number of postdoctoral medical investigators. Many alumni in the life sciences can attribute their knowledge of instruments and research methods to the training they received as students of Professor Lion. His teaching laboratory was so outstanding that its development was supported for many years by the National Science Foundation.

In research, Dr. Lion's laboratory has produced a long and distinguished list of publications in the field of biomedical and chemical instrumentation, with special emphasis on the application of transducers to a variety of measurements on living systems. Much of this research lead to patents and industrial applications which have been exploited through the Lion Research Corporation, founded with some of his former students. During the past 28 years, a host of thesis students have carried on research under Dr. Lion's supervision and have gone on to key positions in industry and in academic institutions.

Dr. Lion is highly regarded by his fellow faculty members, as well as by his students, and all join in recognizing of his distinguished academic career on the occasion of his retirement from M.I.T.

—Irwin W. Sizer
Dean of the Graduate School



Philip M. Morse
Professor of Physics

Phil Morse has had several careers, any one of which would have sufficed for an ordinary man. At the beginning of his career he pioneered on the then-new quantum theory and its application toward the understanding of atoms, molecules and crystals. He contributed to the theory of gas discharges and to the theory of stellar formation. He revolutionized acoustics. During World War II, he was among the first to apply and develop the new methods of operational analysis. He achieved outstanding success in anti-submarine warfare, an accomplishment which was among the decisive elements in the Battle of the Atlantic. Today he is Director of the Operations Research Center at M.I.T. He recognized very early the importance of the computer and was the first Director of the M.I.T. Computation Center. He was the first Director of the Brookhaven National Laboratory. The Editor of the *Annals of Physics*, he has been the author of numerous books and papers.

Phil has always taken an active interest in the teaching program of the Physics Department and in the general educational policies of M.I.T. Well before the current fashion he would give the bright undergraduates a special unscheduled course in quantum theory. Among these students was Richard Feynman.

It was much easier in the halcyon, relaxed days before World War II to get to know the departmental professors. I was one of those graduate students, and I soon learned of Phil's wide-ranging interests in history, politics, archeology, music, and the theater. These are not mere entertainments. Phil devotes to them the energy and depth of study which many reserve for professional work.

His enthusiasm for knowledge and understanding has been transmitted to many of those who worked with him. By his example he has taught us that the mark of the educated man is his breadth of knowledge and his intellectual integrity.

—Herman Feshbach, Ph.D.'42
Professor of Physics



Norman J. Padelford
Professor of Political Science

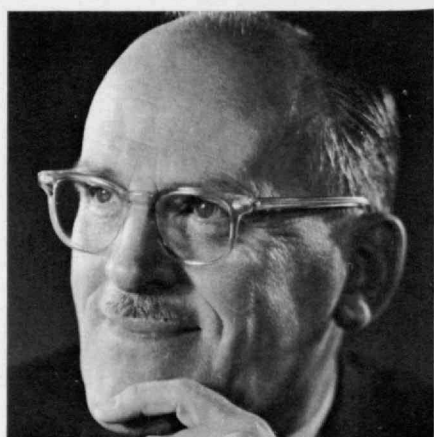
Informal tributes such as this all too often are indistinguishable from obituaries. This is decidedly not an obituary. Norman Padelford is alive and well at M.I.T. He may be seen striding through the Institute's corridors with a step that men half his age can envy; breaking new ground in his field of international law and organization; and characteristically giving his students full value and more for their tuition.

Norman still teaches the way teaching should be done—with enthusiasm, with indisputable mastery of his subject, and with a concern for the student that has won him the deep appreciation of many. It was typical of that concern that for years he quietly used his own book royalties to purchase subscriptions to professional journals for what is now the Political Science Department.

His work on the Panama Canal Treaty remains definitive. Twenty-seven years later his research once more focuses on the sea—this time, perhaps because of his feeling for his beloved Maine Coast—on the law and politics of the uses of the sea and seabed. In addition he co-authored a much-used and definitive text on international politics, and wrote extensively on the United Nations and regional organizations, incidentally serving as a vigorous and innovative chairman of the Board of Editors of the journal *International Organization* as well as fulfilling many other academic and scholarly roles of distinction.

This is a personal appreciation, and I may be forgiven a personal reminiscence. When I arrived at M.I.T. 12 years ago to begin a second career as scholar, Norman immediately and unstintingly opened every professional door to me, sharing with me virtually all his own professional opportunities—an act of kindness based on modesty and generosity that is typical of the man we shall miss so very much when he does fully retire from M.I.T.

—Lincoln P. Bloomfield
Professor of Political Science



Francis O. Schmitt
Institute Professor; Professor of Biology

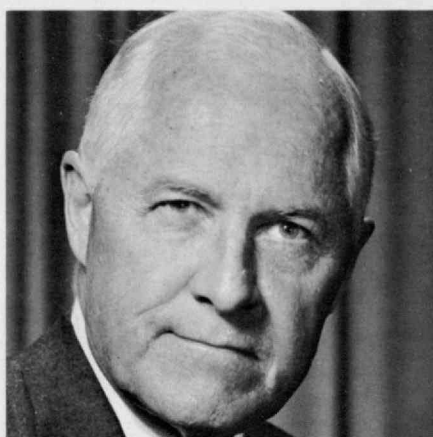
Many measures are used for a man's scientific stature. Surely one of the most cogent is the range of his scientific vision. Throughout his whole career Francis Schmitt has foreseen the science of one and two decades hence, he has helped to create this science, and he has transmitted his clear foresight to successive generations of students.

In the late 1920's and early 1930's he foresaw the essential need for and the great advances that would derive from the application of the techniques and concepts of physical science to problems of biology. In the 1940's and early 1950's he built at M.I.T. what we might now well call the first center of molecular biology. Throughout the 1960's he has guided and nurtured the beginnings of what is surely becoming a revitalized neurobiology to serve as the base for a massive assault upon the biology of the mind.

To all this Francis Schmitt has brought his energy, his dedication, his clear intelligence, his sense of quality and his insistence upon solid accomplishment. He has also brought a warmth of heart and an openness of character. He has always been human and he has always been genuine. Through these qualities he has won a profound respect for his standards and science, and he has fully deserved the deep affection so evident in his friends and colleagues and students.

Fortunately, after he retires from M.I.T. Frank will continue to construct the framework for the biology of the 1970's and 1980's, and the results of his foresight will be seen ever larger at M.I.T. and throughout science in the years to come.

—Robert L. Sinsheimer, '41
Chairman of the Division of Biology
California Institute of Technology



Thomas K. Sherwood, Sc.D.'29
Professor of Chemical Engineering

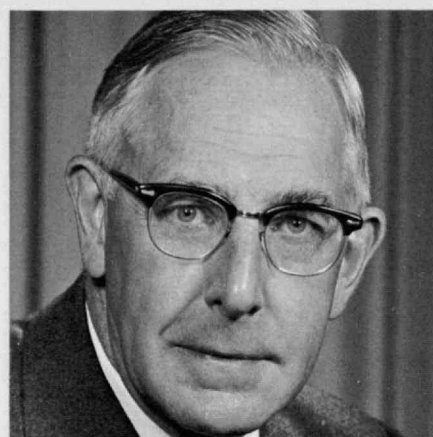
It is unlikely that any one person can describe the many-faceted character of Tom Sherwood. Thus, even as one having had the pleasure of over 30 years of association with him, it is with some trepidation that I attempt to do so. From the very beginning of this period it became apparent, even to a callow new graduate student, that he was preeminently a dedicated teacher—but in far from the usual narrow sense of this phrase. His teachings bring the real professional world of engineering into focus—along with a highly competent analysis and explanation of theory. By example and guidance, the young researcher under his direction learns to ask definitive and perceptive questions to get at the heart of problems. Sage and judicious reasoning mark his counselling of students and associates. Although willing to serve when needed as a dean, his pleasure and relief on being permitted to return to full-time teaching duties could not be mistaken.

As one of the world's foremost authorities in the field of mass transfer, Tom's capabilities meet that ideal combination of a great teacher and outstanding researcher. In his many activities on public service advisory committees and in consulting for industry, both of these capabilities are brought to bear with great effectiveness.

Lightening all these serious pursuits is an all-pervading sense of humor, ranging from the intellectual to the ribald. He is an ardent skier and mountain climber, an amateur painter of no mean competence and a raconteur par excellence. He enjoys the good things in life and makes a jovial companion.

With all of these attributes it is easy to predict that Tom's retirement will be "official" only; we may rest assured that he will continue to contribute in a very substantial way to the education of young and old and to public service activities.

—Glenn C. Williams, Sc.D.'42
Professor of Chemical Engineering, M.I.T.



Cyril Stanley Smith, Sc.D.'26
Institute Professor; Professor of the
History of Science and Technology; Pro-
fessor of Metallurgy

When the Manhattan Project wanted a top-flight metallurgist for the Los Alamos Laboratory, I had no hesitation in recommending the man to fill the spot. That was in 1943. I knew Cyril Stanley Smith as a distinguished alumnus of M.I.T., highly respected for his theoretical studies and for his research on the alloys of copper. He was a metallurgist of great practical ability and a dedicated scientist, the ideal man for Los Alamos.

When it was all over and V.J. day had come and gone, the University of Chicago chose Cyril Stanley Smith to lead its Institute for the Study of Metals, the unanimous recommendation of everyone consulted. It was a happy choice, and the Institute thrived under his leadership for some 15 years. It was during this period that he completed his celebrated work on the topology of grain structures in metals.

During the summer of 1960 I was in a little cabin in the Colorado mountains. One morning a neighbor called me to his telephone. It was Jay Stratton, on the other side of the mountains. Would we like to have Cyril Smith as a professor at M.I.T. on a joint appointment between Metallurgy and Humanities? Would we indeed! But how can we get him away from Chicago? That, replied Jay, is where the Humanities come in. Cyril wanted to develop his old interest in the history of metallurgy and the ancient history of science in general. The enthusiasms of both departments have seen their fulfillment in the nine years that have elapsed. Not only metallurgy and history but also archeology and art have been enriched by his many contributions. Not only students but also colleagues have acquired a new appreciation of the skill and patience of the ancient craftsmen whose artistry in metals remains an inspiration to a less artistic generation.

—John Chipman
Professor of Metallurgy, Emeritus

Continued from page 110
American Brass Company before World War II, worked at the Los Alamos National Laboratory from 1943-46, and was Professor of Metallurgy at the University of Chicago before coming to the Institute. He has maintained active professional interests in polycrystalline materials structures and in the application of metallography to the study of archaeological artifacts.

Awards Convocation

The sounds of a brass band in the Great Court signaled the opening of the annual Awards Convocation in late May, when outstanding contributions in athletics, scholarship, and leadership brought awards to over 40 students, two student organizations, three members of the faculty, and one M.I.T. employee.

The coveted Karl Taylor Compton Awards for outstanding contributions in promoting high standards of achievement and good citizenship within the M.I.T. community were presented to six seniors and one campus organization:

Daniel J. Fingerman, '69, President of Random Hall for two years and active in Alpha Phi Omega, "whose concern for his fellows is reflected by leadership in numerous programs benefiting M.I.T. and the Cambridge community."

Anthony George, '69, Chairman of the East Campus Lecture Series and Seminars for two years, "whose quiet and selfless leadership has made a lasting contribution to the quality of life at East

At the 1969 Awards Convocation: Richard P. Reavis, porter in Burton House, receives the James N. Murphy Award from President Howard W. Johnson; and winners of the prestigious Compton Awards (standing, left to right): Anthony George, '69, Mark J. Mathis, '69, Daniel J. Fingerman, '69, and Robert G. McGregor, '69; (seated, left to right): Peter Q. Harris, '69, Maria L. Kivisild, '69, Shirley A. Jackson, and Fred D. Johnson, Jr., '72.



Campus and to the larger M.I.T. community."

Peter Q. Harris, '69, Chairman of the Student Committee on Educational Policy this year and a member for three years, "for sustained and creative efforts to reform educational policy and student government at M.I.T."

Maria L. Kivisild, '69, 1968-69 President of the Undergraduate Association, "who by her example has encouraged greater student concern for all facets of Institute life."

Mark J. Mathis, '69, President of the Class of '69 for four years, "leader of his class whose successful efforts brought contemporary issues before the M.I.T. community through the Compton seminars."

Robert G. McGregor, '69, member for four years and President this year of the M.I.T. Glee Club and active in other extra-curricular activities, "for clear perception and outstanding leadership in educational planning and extra-curricular activities."

The Black Student Union "for their determined and effective role in increasing educational opportunities for black Americans at M.I.T." This award was received by Shirley Jackson, a graduate student in physics, and Fred D. Johnson, Jr., '72, Co-chairmen of the Union

Among other awards:

The outstanding Freshman Award to Peter A. Sanders, Jr., '72, who also shared the Quadrangle Club Award for the outstanding freshman athlete;

The James N. Murphy Award to Richard P. Reavis, porter in Burton House who has worked at M.I.T. for 20 years: for an employee of the Institute "for spirited contributions to the life of the Institute and particularly to students."



Everett Moore Baker Awards for outstanding undergraduate teaching by junior faculty to Louis L. Bucciarelli, '66, Assistant Professor of Aeronautics and Astronautics, Irwin M. Rubin, Ph.D. '63, Assistant Professor of Management, and Harry M. Schey, Instructor in Physics.

A "Giant Step Forward" for Behavioral Science

Behavioral scientists in several departments at M.I.T. have proposed Department of Defense support for a new program in computer analysis and modeling applied to such fields as psychology, political science, economics, sociology, and urban planning.

Their hope is to provide a data processing capacity entirely new to the behavioral sciences, to help themselves and their colleagues "proceed from complex data to the formulation of theories. Behavioral science depends heavily on data but lacks the tools to analyze and organize them effectively," they say. "Computer methods may move the behavioral sciences a giant step forward."

The computer's capabilities would be applied, for example, to research in the psychology of communications, the acceptability of new ideas in mass transportation, manpower utilization in the U.S., social organization in Asian villages, sociological and psychological bases for attitude changes, new approaches to organizing public and specialized libraries, and the growth and operation of complex political systems.

A total of \$1.5 million has been proposed to the Behavioral Science Division of the Advanced Research Projects Agency, Department of Defense, for the first year's activities, and over a five-year period the costs could be as much as \$7.6 million.

The project is proposed to be completely unclassified.

The plan results from the collaboration of more than 50 behavioral scientists in the Cambridge area over the past several months: principals among them have been Joseph C. R. Licklider, Professor of Electrical Engineering, and Ithiel D. Pool, Professor of Political Science, both of M.I.T., and Professor Frederick Mosteller of the Harvard Department of Statistics.

Campus attention was drawn to the Cambridge Project proposal by liberal student and faculty groups who claimed that "the infusion of so much money into M.I.T.'s social sciences program will lead to a further emphasis on computerized people-manipulation." Professor Licklider responded by saying that the development of advanced computer methods in social science is vital to dealing with the nation's social problems.

Taking note of the controversy, Jerome B. Wiesner, Provost of M.I.T., wrote the faculty his (and President Howard W. Johnson's) belief that the proposal represents a thoughtful effort of faculty "to enhance the quality and potential of their research through expanded access to more powerful . . . computing.

"The freedom of members of this faculty to take such initiatives, to decide the direction of their research, and to seek support from open sources has been a distinguishing mark of the M.I.T. environment," he wrote.

Winquist Memorial

A bronze contemporary sculpture, "Auro," by Lyman Kipp, has been placed in the garden of the M.I.T. Endicott House in Dedham, Mass., as a memorial to the late Gertrude B. Winquist, the first manager of the House.

This concert by Gregory Tucker, piano, Eleftherios Eleftherakis, viola, and Ray S. Jackendoff, clarinet, at the M.I.T. Endicott House followed the dedication of a memorial to the late Gertrude B. Winquist there this spring.



Mrs. Julius A. Stratton, recalling at dedication ceremonies on May 18 Mrs. Winquist's services to M.I.T. through both Endicott House and the M.I.T. Art Committee, said that she possessed "a unique combination of the qualities one cherishes most in human relationships—loyalty, imagination, high spirits, vigor, a capacity for always meeting deadlines, and complete intellectual integrity."

Other speakers, before an audience of some 60 former friends and colleagues, included Mrs. Jerome S. Rubin, Chairman of the M.I.T. Art Committee, Howard W. Johnson, President of the Institute, and Philip A. Stoddard, '40, M.I.T. Vice President who is President of the Board of Governors of Endicott House.

Mrs. Winquist came to M.I.T. in 1955 as Manager of Endicott House following undergraduate study at the University of New Hampshire, graduate work at Wellesley College and varied experience in the foreign service and in innkeeping. She joined the Ford Foundation 10 years later, to supervise housekeeping in the Foundation's New York headquarters.

Samuelson on Economics

"Where can an M.I.T.-trained economist best use his talents?" asked an undergraduate at a seminar given by the Undergraduate Economics Association. In the government, replied speaker Paul A. Samuelson, Professor of Economics.

An important reason, he said, is that the "new" economics being taught at M.I.T. enables students to apply their training directly to real problems.

"Moreover, much of U.S. economic policy of the last ten years has come from M.I.T., Yale, and Harvard, and many young professors have government experience to share with students," said Professor Samuelson. For instance, the investment tax credit idea was formed in the Sloan School, said Professor Samuelson, and

no businessmen were in favor of this idea when it was first suggested to Congress. This government-university interaction is one of the advantages of economics at M.I.T.

Speaking generally, he added that the stability of the business cycle in the 1960's is attributable to this kind of interaction. Usually, a normal business cycle shows 29 months of expansion followed by 29 months of recession. "So far he said, we have had 99 months of expansion—an incredible record. By 1965 the United States had reached a condition of full employment, price stability, and free markets, and "no one knows how to handle that situation."

Spring Sports: Far More Than "Slide Rule Thinking"

For the fourth time in history, M.I.T. was represented at the Henley Royal Regatta in England in July, and the success story of the lightweight varsity crew making the trip overshadows all others from the 1969 spring sports season in Cambridge.

Though the lightweights were second to Harvard at the annual championships of the Eastern Association of Rowing Colleges on Lake Quinsigamond in Worcester in May, Coach Gerrit W. Zwart, M.Arch.'63, says they are "the fastest crew I've ever had the pleasure to coach." On his urging the M.I.T. Athletic Department has stretched the unwritten rule that only first-place winners go to the Henley, and thanks to its own fundraising success the team was on its way to Europe late in June.

In other spring sports, while the freshmen baseball team had an unprecedented 11-2 record the only good thing about the varsity season, said *The Tech*, was that "eventually it must come to an end." The varsity tennis team had "an impressive" 13-4 season. Though "every record in the M.I.T. record book fell before them," the lacrosse team lost the New England Championship to the University of Massachusetts; but four days later the stickmen came back to "murder" Norwich 26-6. The varsity sailors finished second (behind Coast Guard) in the New England Dinghy Championships, and the track season was marked by the fall of a 35-year M.I.T. high jump record to Kirk D. Wings, '71, who cleared 6' 4¼" against Bates College in April.

When it was over Jeffrey M. Weissman, '69, was picked as outstanding senior athlete for the Class of 1948 Award. He played four years of baseball and soccer for M.I.T. and this year was on Greater Boston all-star teams in both sports; this summer he's directing the athletic activities of Upward Bound, a program for underprivileged Cambridge children on the M.I.T. campus. Nancy Green, a staff writer for the *Boston Globe*, found him "a convincing contradiction to the M.I.T. brain-trust image. He knows the school is more than slide-rule thinking."

A camera record of the 1969 spring sports season at M.I.T.: the heavyweight crew vs. Columbia on the Charles . . . intramural rugby on Briggs Field . . . Albert Lau, '72, leading the freshman track team when it "demolished" Bowdoin, 115-34 . . . James P. Glowienka, '71, over the bar . . . action in the lacrosse team's 26-6 "murder" of Norwich. (Photos: Dov B. Isaacs, '71, Richard D. Koolish, '68, Craig R. Davis, '71, and George J. Flynn, '69)



What Is a Dean, Anyway?

Of the seven posts to which M.I.T. gives the title "Dean," one is unique: the Dean of Student Affairs.

Like the Dean of the Graduate School, the Dean of Student Affairs has no strict academic responsibilities and no school under him. Nonetheless, he is responsible for 7,000 students, many committee assignments, and more aspects of M.I.T. residential and extra-curricular life than any other dean.

When Kenneth R. Wadleigh, '43, came to the post in 1961, the job chiefly concerned student counseling. Since then, however, it has mushroomed to include a host of diverse and conflicting responsibilities towards students and administration. But, to the dismay of an M.I.T. which has come to rely on Dean Wadleigh's infinitely rechargeable energies and resourcefulness, he announced his retirement this spring, effective June 30. And, in his wake, two deans will replace the one. J. Daniel Nyhart, Associate Professor of Management, will become the new Dean for Student Affairs, while a second post, the Dean for Institute Relations, will assume some of the community responsibilities formerly under Dean Wadleigh's umbrella. It will be filled by Dr. Bensen R. Snyder, Psychiatrist-in-Chief of the Institute.

Although the charge to the Dean of Student Affairs was broad, "to oversee the general student welfare," Dean Wadleigh told *Technology Review* of the three specific areas in which he has worked: encouraging the growth of community life at M.I.T.; communicating individually with students about both personal and academic matters; and building faculty involvement in the non-academic lives of M.I.T. undergraduates.

He sees the last job as the hardest, and jokes that his successor should be titled instead Dean of Faculty Affairs. "I don't know of such a thing as student problems," declares the one man who could safely be considered an authority on student problems. "The main problems are those faced by the younger faculty.

"One of the prices of having a large, centralized institution is that students and young faculty feel less identification with the place as a whole. They have a hard time believing they can mould or change it. In my job, we try to develop mechanisms which will enable the appropriate rapport between individual and institution to prosper. During the next ten years we will have to wrestle with this," he predicts.

Dean Wadleigh has been right in his predictions before. It was he, who, in 1961, argued for the expansion of the Institute's on-campus housing programs and for large-scale new construction. "Even with the plans we have now (see *Technology Review* for May, 1969, p. 86) we've only begun to solve that problem. We must get young faculty and staff to the living

units to give both students and staff a broader perspective on the place."

Dean Wadleigh may know more undergraduates than any other member of the faculty. And he believes that the M.I.T. student is unique among college students today. "There are two reasons for this. One is that the M.I.T. student is very career oriented. He sees his M.I.T. education as the first step in his profession, which, for him, has already begun.

"The second reason is the fact that many thoughtful students at M.I.T. really believe they can change society through their careers in science and technology. The M.I.T. student has the same gut reactions which other students display while they search for 'relevance.' But the M.I.T. man often sees that he will find a way to make his work socially relevant."

But for the student who has any doubts, there is always a member of the Dean's staff on call to talk with. Dean-of-the-Day and Dean-of-the-Night, as Dean Wadleigh calls it, is a policy he started early in his administration, to foster good student-staff communication. "In addition, I have to try to be able to sit down and talk with anyone—any of the 7,000-odd student undergraduates or staff member—at any time of day. That's a tall order."

Dean Wadleigh told *Technology Review* that the most difficult decision of his career was the decision to accept the job of Dean. And, one suspects, for a man who has made himself liked in a very tough job, the decision to leave must have been equally difficult.

Russian Sloan Fellows

M.I.T.'s Sloan Fellowship Program for "middle-management" training will include two students from the Soviet Union in 1969-70, according to Peter P. Gil, Associate Dean for Executive Programs in the Sloan School of Management. The two whose applications have been accepted for the year-long program are Andrei N. Bykov, an engineer who is a member of the Research Group, and Evgeni E. Dudnikov, Senior Scientific Assistant, both at the Institute of Automatics and Telemechanics in Moscow.

It will be the first time, Dean Gil believes, that Russian scientists and managers have participated in such a program in the U.S. devoted to advanced management concepts.

Individuals Noteworthy

Twelve members of the M.I.T. community elected to membership in the National Academy of Engineering: *Nathan Cohn*, '27, Executive Vice President—Research and Development, Leeds and Northrup Co. . . . *Donald G. Fink*, '33, General Manager of the Institute of Electrical and Electronics Engineers . . . *Harold W. Fisher*, '27, Director of Standard Oil Company (New Jersey) . . . *Robert C. Gunness*, Sc.D.'36, President of Standard



Hsu Yun Fan, Sc.D.'37, Duncan Professor of Physics at Purdue University (right), receives the 1969 McCoy Award for scientific contributions from Frederick L. Hovde, Purdue President.

Oil Company (Indiana) . . . *Thomas F. Jones*, Sc.D.'52, President of the University of South Carolina . . . *Allen Latham, Jr.*, President of 500, Inc. . . . *Brockway McMillan*, '36, Executive Director of the Military Research Division, Bell Telephone Laboratories, Inc. . . . *Julius P. Molnar*, Ph.D.'40, Executive Vice President of Bell Telephone Laboratories, Inc. . . . *Robert N. Noyce*, Ph.D.'53, Group Vice President, Fairchild Camera and Instrument Corporation . . . *Morrough P. O'Brien*, '25, former Dean of Engineering, University of California (Berkeley) . . . *Courtland D. Perkins*, S.M.'41, Associate Dean of the School of Engineering and Applied Science, Princeton University . . . and *Charles E. Reed*, Sc.D.'37, Vice President—Components and Materials Group, General Electric Company.

To *Richard G. Alexander*, '49, the Liberty Bell Award of the Philadelphia Society for Paint Technology "for outstanding contributions to the advancement of the protective coatings industry and to the Philadelphia Society" . . . To *Thomas R. Camp*, S.M.'25, the Freeman Award of the Boston Society of Civil Engineers . . . To *Jacob P. Den Hartog*, Professor of Mechanical Engineering, Emeritus, the 1969 "Engineer of the Year" Award of the Engineering Society of New England.

Donald D. Hanson, M. Arch.'57, is one of three architects whose plan for a new city hall in Amsterdam has been chosen in an international design competition . . . To *Jerry B. Minter*, 2d, '34, President of Components Corp., the Armstrong Medal of the Radio Club of America for his "outstanding contributions to the radio art."

To *Mark W. Vande*, a fourth-year student in the M.I.T. Department of Architecture, the 1969 Reynolds Aluminum Prize for the "best original architectural design in which creative use of aluminum is an important contributing factor." (Mr. Vande's design was for a mobile children's day-care unit to accompany a core of 10 to 15 migrant families during the growing season.)

To *Miles N. Clair*, S.M.'23, the Howard Coonley Medal of the U.S.A. Standards Institute for "notable service to the national economy through standardization . . . To *John E. Burchard*, '23, Dean Emeritus of the School of Humanities and Social Studies at M.I.T., the Thomas Jefferson Memorial Foundation Medal in Architecture of the University of Virginia . . . To *Augustus B. Kinzel*, '21, Honorary Membership in the Institute of Electrical and Electronics Engineers . . . To *Donald R. Wiles*, '54, the Extractive Metallurgy Award of the Institute of Electrical and Electronics Engineers.

Melvin E. Salvesson, S.M.'47, to President of Computer General Corporation, a new holding company to acquire computer-oriented enterprises . . . *William S. Edgerly*, '49, to Vice President—Finance of Cabot Corporation . . . *Dwight B. Crane*, '59, to Lecturer and member of the Faculty of Business Administration at Harvard University . . . *Frederick J. Ross, Jr.*, '46, to Group Vice President—Abrasive Systems of Carborundum Company . . . *Albert E. Cookson*, S.M.'51, to Senior Vice President of International Telephone and Telegraph Corporation.

A. Scheffer Lang, '49, former Administrator of the Federal Railroad Administration in the Department of Transportation, to Visiting Professor of Civil Engineering, M.I.T. . . . *Kenneth N. Davis, Jr.*, '46, to Assistant Secretary of Commerce for Domestic and International Business . . . *Norman R. Scott*, '40, to Dean of the University of Michigan Dearborn Campus . . . *James Lago*, S.M.'47, to Director of Chemical Engineering Research and Development at Merck, Sharp and Dohme Research Laboratories . . . *Thomas F. Morrow*, '35, to Second Executive Vice President of Lockheed Aircraft Corporation . . . *Robert R. Everell*, '43, to President of Mitre Corporation.

To *Jerome C. Hunsaker*, Sc.D.'23, Professor of Aeronautical Engineering,

Emeritus, the Julius Adams Stratton ('23) Prize for Cultural Achievement of the Friends of Switzerland, Inc.

M.I.T. faculty chosen to membership in the National Academy of Sciences: *Samuel C. Collins*, Emeritus Professor of Mechanical Engineering; *Herman Feshbach*, Ph.D. '42, Professor of Physics; *Benjamin Lax*, Ph.D. '49, Director of the Francis Bitter National Magnet Laboratory; *Joseph C. R. Licklider*, Professor of Electrical Engineering; *Boris Magasanik*, Head of the Department of Biology; and *Egon Orowan*, Professor of Mechanical Engineering.

Two 1969 awards of the Institute of Food Technologists: the \$1,000 Babcock-Hart Award, sponsored by the Nutrition Foundation, Inc., to *Samuel A. Goldblith*, '40, Professor of Food Science at M.I.T.; and the \$1,000 International Award supported by the Australian Institute of Food Science and Technology to *Nevin S. Scrimshaw*, Head of M.I.T. Department of Nutrition and Food Science.

The honorary degree of Doctor of Laws from the University of Bridgeport to *Arthur E. Keating*, '17 . . . *Murray Gell-Mann*, Ph.D. '51, Professor of Theoretical Physics at the California Institute of Technology, is one of five new members of the President's Science Advisory Committee.

To *Hsu Yun Fan*, Sc.D. '37, Duncan Professor of Physics at Purdue University, the Herbert Newby McCoy Award for 1968-69 for the Purdue faculty member "making the greatest contribution of the year to science" . . . To Major *John W. Swab*, S.M. '60, the Harvey C. Knowles Award of the American Ordnance Association . . . To *Albert L. Zorbrist*, '64, the prize paper award at the Spring Joint Computer Conference in Boston.

Thornton A. Wilson, S.M. '53, President,

to Chief Officer and *Kenneth F. Holtby*, S.M. '62, to Vice President of the Boeing Company; both attended M.I.T. as Sloan Fellows.

Charles E. Smith, Jr., '49, to President of Robert Heller Associates, Inc., Cleveland subsidiary of Engineers, Inc. . . . *John H. Lutz*, Sc.D. '43, to Vice President—Marketing Services, Scientific Design Company, Inc. . . . *Louis B. Lambert*, S.M.'52, to Vice President for Institute Development, Riverside Research Institute.

To *Dorothy W. Weeks*, Ph.D.'30, the 1969 Achievement Award of the American Association of University Women "for scholarly activities and achievement in the field of mathematics."

Stephen A. Kliment, '53, formerly Editor of *Architectural and Engineering News*, to Director of Research and Information at Caudill Rowlett Scott, Architects, Planners and Engineers. . . . *William J. Weisz*, '48, to Executive Vice President and Assistant Chief Operating Officer of Motorola, Inc. . . . *Albert F. Clear*, '42, to Executive Vice President of The Stanley Works. . . . *Robert W. Lundgren*, '40, Vice President of Detroit Edison Company.

Thomas F. Malone, Sc.D.'46, Vice President of Travelers Insurance Company, to Chairman of the Geophysics Research Board of the National Research Council. . . . *Raymond L. Bisplinghoff*, Dean of Engineering at M.I.T., to Chairman of the Aeronautics and Space Engineering Board of the National Academy of Engineering, whose new members include *Rene H. Miller*, Head of the M.I.T. Department of Aeronautics and Astronautics.

Bruce A. Blomstrom, '59, to Assistant to the President, Libby, McNeill and Libby . . . *William A. McNulty*, '56, to Manager of Engineering, ITT World Communications, Inc. . . . *Edward P. Haladay*, '60, and *Bernard J. Wulff*, M.Arch. '64, to Associates in RTKL, Inc., Baltimore architectural and planning firm . . . *John B. Crews*, '57, to Assistant to the President of the *Los Angeles Times Mirror*.

Lucius P. Gregg, Jr., S.M. '61, to Program Officer and *Kenneth A. Klivington*, '62, to Program Associate at the Alfred P. Sloan Foundation . . . *Howard H. Kerhl*, S.M. '60, to Chief Engineer, Oldsmobile Division of General Motors Corporation. . . . *Robert G. Marcus*, '31, to Chairman of the Board of American Biltrite Rubber Company, Inc.

Joseph C. Whitcomb, '28, to President of the Middleborough (Mass.) Savings Bank . . . *C. Robert Morgan*, '65, to Chairman of the Department of Mathematics at Gordon College, Wenham, Mass. . . . *David R. Israel*, '49, of the Mitre Corporation to Deputy Director for Engineering, Defense Communications Planning Group, U.S. Naval Observatory, Washington, D.C.



B. A. Blomstrom, '59



A. F. Clear, '42



S. A. Goldblith, '40



B. McMillan, '36



J. P. Molnar, Ph.D.'46



N. S. Scrimshaw



C. E. Smith, Jr., '49



D. W. Weeks, Ph.D.'30

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Alumni News

The Frustrations of Technology in Serving the "Human Purpose"

A theme proposing to relate technology, art and government to the "human purpose" greeted over 1,200 Alumni Homecoming Day visitors to M.I.T. on Monday, June 16. The weather was improving, the handshakes warm, the speeches serious. But thoughtful visitors hoping to find new answers for their frustrations over technology's inability to moderate the ills which it has visited on the earth left with inspiration but otherwise largely empty-handed.

The exceptions came chiefly from M.I.T.'s two governors—Francis W. Sargent, '39, of the Commonwealth of Massachusetts and Luis A. Ferré, '24, of the Commonwealth of Puerto Rico, who spoke at the Alumni Homecoming luncheon, when it was announced that public duties would call them away from the afternoon program at which both were to appear.

Opening the afternoon panel, John F. Collins, former Mayor of Boston who is now Visiting Professor of Urban Affairs at M.I.T., described the conference of mayors held the week before in Pittsburgh: "I felt I was seeing a replay," he said. Almost all of what he had heard—the revision of priorities, the redistribution of resources, the *ad hoc* nature of relations between the federal government and the cities, the need for greater responsibility among the states—had been said 10 or even 20 years before.

Awakening the Cities

Professor Collins said that Washington's relatively greater foresight had given the federal government a grasp of city problems that had not been shared by the cities' own governments. This imbalance is now being corrected, by—for example—M.I.T.'s courses for urban executives (see *Technology Review* for April, pp. 108-109), the second of which was then commencing at Endicott House.

Hitherto, said Professor Collins, "government by crisis has not afforded the luxury of careful scientific analysis." Techniques of planning and research that are familiar to executives in the private sector are only now beginning to be taught to local government workers.



M.I.T.'s visitors did honor to their alma mater on June 16—Alumni Homecoming Day. Left to right in this picture, the day's principals were Gregory Smith, '30, who presided in the unexpected absence of Cecil H. Green, '23, Alumni Association

President; M.I.T. President Howard W. Johnson; Luis A. Ferré, '24, Governor of the Commonwealth of Puerto Rico; Francis W. Sargent, '39, Governor of Massachusetts; and James R. Killian, Jr., '26, Chairman of the M.I.T. Corporation.

Among those who face today's urban problems, Jay W. Forrester, S.M.'45, Professor of Management at M.I.T., finds an atmosphere redolent of defense against outside forces. In fact, he said, our urban troubles are caused internally, by the measures taken in the hope of easing them. We act intuitively, whereas complex systems behave in a counter-intuitive way (see his article, "A Deeper Knowledge of Social Systems," in *Technology Review* for April, 1969, pp. 21-31).

Robert C. Wood (formerly Under Secretary of Housing and Urban Development who now directs the Joint Center for Urban Studies of Harvard and M.I.T.) agreed; it is indeed hard to deal with the administrator who works "by the seat of his pants," Professor Wood said, and reluctance to use research is a great obstacle in this field.

Gyorgy Kepes, Director of M.I.T.'s Center for Advanced Visual Studies, introduced

an entirely different theme—the inner life of human beings. Today's city planning, he said, is in the condition of medicine before the modern understanding of psychosomatic relationships—it attends only to the physical problems. But if we lose sight of what human nature really needs, everything we do with physical equipment will be abortive.

Professor Kepes quoted Albert Camus upon receiving his Nobel Prize: "I never forget the sunshine." So the artist has now to find ways, using technology, to reach city-dwellers—to give them something equivalent to Camus' sunshine, without which humankind cannot live.

The Nation's Task

Professor Wood contributed some facts on the magnitude of the task of rebuilding our cities. In the 1970's, he said, the U.S. must find homes for 43 million new city-dwellers. To meet this need requires that 2.6 million homes be built each year; the previous record, in 1954, was 1.6 million. To replace at the same time our 6 million slum homes will require a ten-fold increase in government assistance to cities.

Large as these figures are, said Professor Wood, the effort is smaller in economic terms than the Apollo program. It is a question of mobilization, organization, and will.

Professor Collins made two points about any national effort of this kind: the federal government should not launch urban programs, such as Headstart, without adequate research; and we should recognize that Americans do some things badly—notably, really large-scale efforts.

Professor Collins added that the nation needs a complete analysis of all the important interrelationships which affect its policies. In other words, analysts like Professor Forrester must be given their chance.

There were few contributions from the audience. Perhaps the most notable was the idea that M.I.T. could ease urban problems in Cambridge by selling its campus and moving to the suburbs—even as it did in 1916. Dr. Killian admitted that the idea was not without its temptations. But M.I.T. needs the city, he said, and the city needs the Institute.

M.I.T.'s Two Governors to 1,200 Alumni: "We Need You"

Concrete proposals for bringing scientific skills to the service of the governments they lead came from M.I.T.'s two governors. Sargent of Massachusetts and Ferré of Puerto Rico, at the Alumni Homecoming Day luncheon.

"We need you more than we've ever needed you before," Governor Sargent told the alumni.

Governor Sargent described the special resources associated with M.I.T. which have already made important contribu-



An Alumni Homecoming Day kaleidoscope: morning presentations by Professor George W. Clark, '52 (top left) and David G. Hoag, '46 (top right); folk singing to entertain the younger set by Bruce Foster; the traditional Alumni Day luncheon; President Howard W. Johnson

receives the 25-year reunion gift from Norman I. Sebell, '44; alumni, faculty, students, and non-students in an afternoon dialogue on national and campus issues; and a cheer for Kenneth R. Wadleigh, '43, Dean of Student Affairs, at the annual banquet.



A moment for private conversation: Governor Francis W. Sargent, '39, of Massachusetts (left) with M.I.T. Professor John F. Collins, former Mayor of Boston, during the 1969 Alumni Homecoming Luncheon.

tions to his administration. The government reorganization plan which he has proposed to the legislature was the work of a task force headed by Robert C. Casselman, '39, former Lecturer in the Sloan School of Management; plans for comprehensive health care in the commonwealth are being developed by a team headed by Leon S. White, Associate Professor of Management at M.I.T.; and a task force study of transportation headed by Richard L. De Neufville, '60, Assistant Professor of Civil Engineering.

But all this is not enough, said Governor Sargent. He proposed that students could work in government as interns, faculty and alumni could serve by writing papers on specific problems, by taking part in new task forces, or by taking a year or more off from academic work to become specialists in government.

What's in it for you? An opportunity to take part in the most exciting business there is, said Governor Sargent, plus poor pay and a lot of brickbats. He apologized for trying to steal some of M.I.T.'s most competent people, but "that's just what I intend to do."

Task Forces Searching for Science

The Governor of Puerto Rico told of the 12 task forces which he has established to study Puerto Rico's problems, a kind of "marriage between . . . a new science, which emphasizes social technology, and a new politics, which emphasizes personal involvement." The 12 task forces, working on economic, management, social, and environmental policy problems, will report to an Advisory Council of "problem-solvers in search of science."

Consultants from M.I.T.—including Professors Mason Haire, Edwin Kuh, Charles

L. Miller, '51, and Paul N. Rosenstein-Rodan, were mentioned by Governor Ferré as consultants, and Chandler H. Stevens, Ph.D.'68, is on leave from his M.I.T. duties to serve as research coordinator for the 12 task forces. In addition, a computer-aided system of information collection will be designed—with the help of, among others, two Puerto Rican seniors at M.I.T.—as a link between government and people.

Technology and the Human Purpose

In a series of six morning lectures on Alumni Homecoming Day in Cambridge, more than 600 M.I.T. graduates heard about work in progress in six fields using technology to help alleviate human problems and more fully understand man's environment.

Malnutrition and starvation problems may be solved in the future by a new food source—the single cell protein. Steven R. Tannenbaum, '58, Assistant Professor of Nutrition, explained that this is the only food source available in large quantities without an agricultural base. The cells are grown on a hydrocarbon or carbon source, then dried to form a powder with extremely high protein content. One of the major problems still to be faced before single cell protein will become an actual source of food is to make it palatable. How can this powder be given the taste and texture which will make it acceptable as food to humans?

David G. Wilson, Associate Professor of Mechanical Engineering who calls himself M.I.T.'s "trash man," discussed the "New Technology in Solid Wastes." Every American produces four to five pounds of solid waste each day. When this is added to industrial and agricultural wastes, the problem of disposal obviously reaches astronomical proportions. Dr. Wilson proposed various ways of disposing of and reusing these wastes—a compactor for home use, for example. If he had one, the homeowner could convert his week's trash into a small, delicately scented package ready to be picked up automatically on the street. Other possibilities are trucks which chew anything, hydraulic systems, and reclamation systems for paper, bottles, and glass (see *Technology Review for February, 1969*, pp 28-33).

Vast opportunities are opening up in the relatively new field of ocean engineering, according to Alfred H. Keil, Professor and Head of the Department of Naval Architecture. The oceans are "the last unexplored frontier on earth," he said (see *Technology Review for March, 1967*, pp. 29-35).

David G. Hoag, '46, who is Program Director for the Instrumentation Laboratory's work on Apollo guidance and navigation systems, described the role of these systems in a lunar voyage. After a certain amount of projector

trouble, Mr. Hoag's complex visual presentation—interspersing still and moving illustrations—conveyed a vivid impression of how some of the world's most advanced instrumentation performs some of the world's most difficult control tasks (see *Technology Review for February, 1969*, pp. 41-49).

Astronomy Free from Limitations

He was followed by George W. Clark, '52, Professor of Physics, who outlined the progressive freeing of astronomy from its traditional limitation to visible-light observation, culminating in last year's discovery of high-energy cosmic gamma rays. Despite the relative paucity of such radiation compared with cosmic particle radiation, he reported, it has now been possible (using a satellite) to map out the galaxy in terms of gamma-ray emission.

Marvin L. Manheim, '59, who is Associate Professor of Civil Engineering, described a solution to the problem of how to build new highways without antagonizing segments of the population.

The engineer must begin his tasks by learning as much as he can about the communities whose lives he will be affecting, said Professor Manheim. He must then present a number of trial alternatives to these communities; from the reactions he obtains, he will begin to "home in" on an engineering solution that satisfies as nearly as possible the desires of the various groups; then perhaps the public hearing for this thoroughly negotiated proposal will lead smoothly to its ratification.

Toward "a More Rational and Useful Dialogue"

While M.I.T. faculty shared their hopes for technology's potential to contribute to the "human purpose" at the panel discussion in Rockwell Cage (see above), some 40 students and as many non-students sympathizers took advantage of Alumni Homecoming Day to air their frustrations on these and other issues on the steps of the Student Center—and later in Kresge Auditorium.

The episode had its beginnings at least three weeks before Alumni Homecoming Day, when students representing the Science Action Coordinating Committee—a radical student group devoted to "converting" M.I.T. from its "disservices" to the "human purpose"—asked the Alumni Day Committee for a place on the program. The Committee concluded that the events could not be changed at that late date for a proposal which seemed ill-advised in several respects, and the Alumni Association then proposed alternative opportunities for S.A.C.C. to reach alumni audiences during the summer and next year.

Discontented with these alternatives, S.A.C.C. early in June announced plans for its Student Center rally and invited the participation of a number of non-M.I.T. groups, of which only a few—in-

cluding the Black Panthers and Mothers for Adequate Welfare—finally agreed to come. The meeting, small by its sponsors' predictions, proceeded uneventfully until the completion of its announced program.

Then the students and their sympathizers moved to Rockwell Cage, where there ensued a kind of "confrontation," the S.A.C.C. group demanding to participate in the Alumni Homecoming Day panel then in session within, the Alumni Day Committee and others encouraging them to discuss the issues with a group of alumni and faculty waiting in Kresge Auditorium. After an uneasy hour of oration and persuasion, the young people did in fact adjourn to the Auditorium where Gregory Smith, '30, and Allen E. Silverstone, a graduate student in biology, were chosen as moderators for a discussion.

But it was not a situation calculated to result in thoughtful, reasoning dialogue. Dominic A. Sama, '54, for example, wrote the *Boston Globe* that the students' "Marxist" polemics . . . overshadowed the 'issues' which they wished to discuss."

The end came late in the afternoon, when the Kresge audience voted (some intemperately) to proceed with the scheduled showing of Apollo movies. Post-session discussion groups formed spontaneously in Kresge lobby. But predictably no one feels sure that these provided enough communication to temper the too-easy stereotypes of each other held by both the students and the alumni.

That evening, after the traditional Rockwell Cage dinner, President Johnson recalled the events of the afternoon: "We did not wrap you in cotton batten," he told the alumni. "We were listening to some 80 or 90 people, only some of them from M.I.T. . . . We don't agree with their point of view, but we didn't shut the door on them either, and that's a hard course to follow."

Mr. Smith's judgment is not dissimilar. "It may be asked whether it does not do some good," he told the Editor, "for people of widely divergent opinions and philosophies to meet and tell it 'like it is.' Such an event may be the necessary first stepping stone to developing a more rational and useful dialogue in the future."

Alumni Fund and Class Gifts: Record Totals and a \$2000 Award

The 1969 M.I.T. Alumni Fund, having reached \$2,442,463 toward its goal of \$2.7 million, holds the American Alumni Council's prize for highest sustained performance among U.S. major private universities—and third place in sustained performance among all institutions.

The 1969 Fund total—highest in history as of June 16—and the unique \$2,000 prize were announced at the 1969 Alumni Homecoming luncheon by Gregory Smith, '30, in connection with his

tribute to Howard L. Richardson, '31, who has served as Chairman of the M.I.T. Alumni Fund Board since 1967. Near-record totals of five-year reunion giving were also reported.

As of June 16, when the results were tabulated, 18,129 alumni had contributed to the 1969 Fund. Additional contributions received before the July 1 deadline were expected to bring the total very close to the Fund's 1969 goals.

Three reunion classes announced five-year reunion gift totals of \$1,694,293 at the Alumni Homecoming Day luncheon.

Norman I. Sebell, Class Agent for the Class of 1944, listed \$525,768 in gifts during the five years previous to the class reunion which concluded at Alumni Homecoming Day. It was the second largest 25-year-class gift in M.I.T.'s history, and Mr. Sebell said 598 members of the class had participated. He paid special tribute to the late Robert S. Faurot, who had served as Reunion Gift Chairman before his untimely death.

W. Gordon Bowie, Reunion Gift Chairman of the Class of 1929, reported \$513,900 in gifts, and in addition he called attention to a bequest from one member of the class which has already yielded "in excess of \$3 million" for M.I.T., bringing the total of class benefactions to a record \$3.6 million.

The second largest gift in M.I.T. history from a 50-year class—the smallest M.I.T. class in the past 75 years—was announced by Paul D. Sheeline, reporting a five-year total of \$659,000 from the Class of 1919. In addition, Mr. Sheeline said, bequests to M.I.T. with a present value in excess of \$500,000 are known to have been arranged by members of the class.

Howard W. Johnson, President of the Institute, said in acknowledging the gifts that "especially in these turbulent times" he attached greatest importance to the evidence of "generosity, spirit, and loyalty" among alumni which their support of the Institute represents.

To Perpetuate the Environment

In a world of change, Warren W. Walker, '29, chose to emphasize the unchanging in his eulogy to 456 M.I.T. alumni reported deceased between June 1, 1968, and June 1, 1969, in the M.I.T. Chapel on Alumni Homecoming Day.

"The greatest resource of any nation is its manpower enriched by the human spirit—and particularly the professional manpower guiding our institutions and industries which are the hallmark of our civilization," he said.

"As we pay tribute to those . . . graduates of M.I.T. who have completed their work in our world during this past year, . . . let us dedicate ourselves anew to passing on to succeeding gener-

ations an economic, philosophic, and and spiritual environment, enriched by our intellectual power the foundation of which was engendered by our alma mater."

The Reverend Robert L. Meier, '44, Minister of the Maple Street Congregational Church of Danvers, Mass., officiated at the service on June 16, and Adele Holevas of the Institute staff served as organist.

New Alumni Officers

Nine alumni have been elected in the M.I.T. Alumni Association's 1969 national balloting to hold major offices in the Association for the coming year.

The new officers are:

Philip H. Peters, '37, Senior Vice President of the John Hancock Mutual Life Insurance Company, Boston, President of the Association.
Harold W. Fisher, '27, Director of the Standard Oil Company (New Jersey), New York, Vice president of the Association.
Russell L. Haden, Jr., '40, President of Ionics, Inc., Watertown, Mass., Vice President of the Association.

New members of the Association's Board of Directors are:

John W. Barriger, 4th, '49, Manager of Transportation Control Systems, Commercial Electronics Division, Sylvania, Bedford, Mass.
Thomas F. Malone, Sc.D.'46, Senior Vice President and Director of Research, Travelers Insurance Company, Hartford.
Stanley M. Proctor, '43, President and Treasurer of Stanley M. Proctor Company, Cleveland.
Ellis C. Littmann, '33, President and Treasurer of Nixdorff-Krein Manufacturing Company, St. Louis.
Paul P. Shepherd, '53, Vice President of Cabot, Cabot and Forbes, San Francisco.
William C. Howlett, '49, President of Union Iron Works Company, Herndon, Va.

Successful candidates for posts representing three districts of the Association on the 1970 National Nominating Committee are:

District 5, the Middle East Coast—William H. Bertolet, 3d, '48, Vice President of Laurel Products Corporation, Philadelphia.
District 6, the East Central U.S.—Joseph E. Dietzgen, '41, President of Eugene Dietzgen Company, Chicago.
District 7, the Southeastern U.S.—Hugh W. Schwarz, '42, Vice President and Director of Corporate Planning, the Coca-Cola Company, Atlanta.

The Class of 1944: Putting The "Feedback Loop" To Work

After 25 years, how wide is the "generation gap" between M.I.T. and the Class of 1944?

Howard W. Johnson, President of M.I.T., told the class at luncheon on June 14 that in one sense the gap is just as



Selections from a photo album of June, 1969, on-campus reunion events—Above, the Class of 1944: trying the "straw" hats, a panel discussion on the 25-year "gap," Norman Beecher presiding at the Saturday luncheon, Professor Truman S. Gray, Sc.D.'30, and friends at the luncheon, gathering for the official picture, and oldsters and youngsters at the Duxbury clambake. Below, the Class of 1914 entertaining President Howard W. Johnson, James R. Killian, Jr., '26, and Mrs. Karl

T. Compton; the Class of 1924 celebrating with classmate Luis A. Ferré, Governor of Puerto Rico; and the Class of 1919 receiving the red coat and entertained at the President's House.



wide as it looks: today's students, he said, have no experience with a military threat such as confronted the nation 25 years ago; they have no experience with widespread unemployment which made "60 million jobs" an election slogan. Instead, today's students are concerned with "a new generation of problems" which focus on the achievement of "social justice, effective liberty and choice."

The problem, said President Johnson, is to develop in our youth "the kind of understanding we have not had of all the great issues" confronting our society.

Just how different is today's M.I.T. from that institution whence came the Class of 1944 had already been made clear in a Saturday morning session for the 25th reunion members. In 1944, said Kenneth R. Wadleigh, '43, Dean of Student Affairs, it was "sink or swim"—the students took what the faculty gave them. Today an M.I.T. education has a "completely different character." The students coming to the Institute today do so with many different expectations, he said, and trying to meet their individual needs is "a major thrust" of the educational program.

The result, said Walter A. Rosenblith, Chairman of the Faculty, is that today's M.I.T. education is "more than you read in the catalog;" the Institute now presents both students and faculty with "more degrees of freedom than ever before." So, he said, the Institute is a place of both diversity and complexity, "a place hard to know and describe."

Its alumni must come to know M.I.T. far better, said Professor Rosenblith. A university cannot be stable without "an outside feedback loop that goes through the alumni," he declared, and "we have not had the kind of dialogue we need to avoid a growing generation gap between students and alumni."

1969 Alumni Officers' Conference: Expectations and Fulfillment

More than 500 officers of M.I.T. clubs and classes, Alumni Fund workers, members of the Educational Council, and other alumni officially serving the Institute are expected at the 1969 Alumni Officers' Conference on Friday and Saturday, September 5 and 6. The two-day meeting will officially inaugurate 1969-70 Alumni Association activities.

The program will include an intensive review of current campus issues at M.I.T. by a panel of faculty, administration, and student representatives; seminars on such special topics as curriculum, educational environment, admissions policies, financial aid, and student activities; and lecture-demonstrations of current research and teaching activities at M.I.T.

Housing will be provided on the campus, and wives will be invited to attend as guests of their husbands.

The meeting will be preceded by a special workshop for M.I.T. Class Secretaries on Thursday afternoon, September 4, which will focus especially on problems of class reports and communications.

How to Start and Run a Small Business

"How to Start Your Own Business," a topic presumed of special interest to recent M.I.T. graduates, will be the subject of a two-day seminar at M.I.T. on October 4 and 5, 1969. It represents a pioneering effort of the M.I.T. Alumni Association to provide programs designed expressly for younger M.I.T. alumni, according to Fred G. Lehmann, '51, Secretary of the Association.

The seminar plans include presentations by senior alumni in business on such topics as technical entrepreneurship, marketing, financing new enterprises, business information systems, legal problems, technical development, and production. In addition, there will be workshops in such areas as consulting engineering, computer hardware and software, manufacturing, and services.

A minimum registration fee (\$25) will cover lecture and workshop sessions, and meals for seminar members. Attendance is limited to members of classes from 1957 to 1965, and reservations are available through the Alumni Association office.

Plans for the seminar are being developed by a committee including Martin H. Schrage, '63, Chairman, Charles Hieken, '51, Mr. Lehmann, Robert H. Scott, '64, Panos D. Spiliakos, '66, and Carol E. Van Aken, '65. The faculty committee from the Sloan School, responsible for selecting curriculum and seminar speakers, includes Edward B. Roberts, '57, Associate Professor of Management, and Christopher R. Sprague, '60, Assistant Professor of Management.

1969 Alumni Seminar: Technology and Medicine

How engineering and medicine are moving closer together, and how the results may yield improved medical techniques and increased efficiency in their application to ever-broader segments of the population, has been announced as the subject of the 1969 M.I.T. Alumni Seminar.

Sessions will begin at noon on Saturday, September 6, and conclude in the late afternoon on Monday, September 8, and reservations are now being accepted at the M.I.T. Alumni Association.

The three-day session, including prepared papers, discussion meetings, and a final panel presentation, will cover a broad range of topics—the current status and problems of medical care, new clinical applications of engineering methods and instrumentation, economic and manpower problems in the delivery of health care, and new directions in

medicines. There will be discussions of new techniques, and seminar participants will be asked to prepare themselves for the intensive three-day program through a special series of readings made available in advance.

Jack P. Ruina, Vice President of M.I.T., is Chairman of the committee developing the Seminar program, and it will rely heavily for content upon the developing plans for collaboration in medical research and education between M.I.T. and the Harvard Medical School.

Twin City Election

On April 30, The Twin City Chapter of the M.I.T. Alumni Club was privileged to have Mr. Vincent A. Fulmer, Vice President and Secretary of M.I.T., as guest. After dinner, Mr. Fulmer presented "Woods Hole and M.I.T.: A New Partnership in Ocean Science and Engineering."

A brief business meeting was also held for the purpose of adopting a club constitution and electing officers and directors for the coming year. The new officers are: President, Keith R. Johnson, '52; Vice President in Charge of Public Relations, John A. Maynard, '46; Vice President in Charge of Membership, Graham Lust, '57; Vice President in Charge of Programs, William Peck, '40; Treasurer, Bjorn A. Rossing, '56; Secretary, David Rubin, '65.

The new directors are: The foregoing officers; Edward L. Bronstein, Jr., '51; David A. Cahlander, '59; Harold D. Field, Jr., '48; William H. Lang, '22; Alan L. MacLean, '44; Gerry E. Morse, '30 and John G. Rauma, '51.

M.I.T. Club of Delaware Valley Annual Meeting

At the Annual Meeting on May 10, James S. Rumsey, '40, presented an excellent talk on the new fabric known as "Qiana" illustrated by movies taken at the couturier Paris openings and by samples of the fabric.

In a short business meeting, the following alumni were re-elected officers of the Club for the coming year: President, Lee C. Eagleton, '44; First President, John B. Murdock, '41; Second Vice President, A. Rufus Applegarth, '35; Third Vice President, Barrett B. Russell, '43; Treasurer, Harold R. Spaans, '30; Secretary, Edward S. Halfmann, '36; Assistant Secretary, Jack A. Raymond, '58. The following were re-elected to the Executive Committee: Robert F. St. Aubin, '64; George A. Schnabel, '60; Christian Schlemmer, Jr., '59; Russell F. Hodges, '49; Robert E. Wilson, '54; Rea W. Stanhouse, '41; and Arthur D. Bertolett, '31.

M.I.T. Club of Western Maine: Changes in Student Attitudes

More than 50 alumni and guests attended the spring dinner of the M.I.T. Club of

Western Maine, held on May 15 in Portland. Donald P. Severance, '38, Executive Vice President of the M.I.T. Alumni Association, spoke on changes in student environment and attitudes at the Institute. As an introduction he played a tape of Vannevar Bush's talk on Youth presented at the Alumni Council meeting on May 27, 1968. This furnished an ideal background for his own discussion of M.I.T. activities and student relations. Guests included several prospective M.I.T. students from this area who have been accepted for entrance to the Institute this fall.

Boston Stein Club: "A Whole New Realm of Change"

Three years ago, when the Boston Stein Club's scholarship fund reached \$200,000, Julius A. Stratton, '23, President of M.I.T., spoke about change at M.I.T.—change in curriculum, in students, in faculty, in impact.

The scene was reenacted on May 7, when President Howard W. Johnson came with Dr. Stratton to celebrate the Stein Club's achievement of a \$250,000 fund for M.I.T. scholarship aid. His topic, too, was change, but Dr. Stratton admitted that today's is a whole new realm of change—"a troubling but an exciting one," he said.

The great issue of change for M.I.T. today, said President Johnson, is of its own making. Science is changing, becoming immensely more diverse. And at the same time, M.I.T. is becoming an institution of even greater diversity, attracting students interested in more and more different fields and problems. "Each of our students is more than before an individualist," President Johnson told the Stein Club members, "and each wants to tailor his life at M.I.T. to his own interests and expectations." The Institute's basic problem, said Mr. Johnson, is to respond by devising an education for diversity which will be as good as the science and engineering education which it has provided in the past.

The future will demand of M.I.T. students that they enter society able "to reduce uncertainties, to make decisions in the face of ambiguity," said President Johnson. These talents will not be the result of skills so much as of outlook, he believes—"a set of basic qualities" to enable future leaders to "deal with ambiguity, not perpetuate it." The challenge to M.I.T., said President Johnson, is to define and nurture these qualities.

The party, which drew more than 100 members of the Boston Stein Club to the M.I.T. Faculty Club, was a dual celebration—the Club's 25th birthday, and its achievement of the quarter-million mark in scholarship funds for M.I.T. Stanley S. Shein, '48, presided as President of the Stein Club and Oscar H. Horovitz, '22, presented the \$50,000 increment of Stein Club funds to President Johnson.



On the 25th anniversary of the founding of the Boston Stein Club, nearly 100 of its members and their guests gathered at the M.I.T. Faculty Club for a birthday party. It was a triple celebration—marking also the achievement of \$250,000 in the Stein Club's scholarship funds for M.I.T. and the return to one of their favorite podiums of Dr. and Mrs. Julius A. Stratton ('23). The before-dinner reception included visits with Dr. and Mrs. Stratton and President Howard W. Johnson (left picture, above), and after dinner Oscar H. Horovitz, '22, presented a paper to President Johnson (right picture, above) symbolizing the Stein Club's efforts for M.I.T.



M.I.T. Club of the Lehigh Valley

Dr. Fred H. Martin, Instrumentation Laboratories Technical Director for Apollo Mission Development, brought Lehigh Valley alumni up-to-date on America's moonlanding program and M.I.T.'s important part in it. Forty area alumni and their guests gathered at the Bethlehem Club on April 22 for dinner before the program. Dr. Martin's talk, illustrated with slides and several color movies, dramatically displayed not only the technical complexity but also the adventure and beauty of the Apollo program which is about to take U.S. Astronauts to the moon.

Horizontal Elevators and Vertical Parking?

Central Florida Alumni and their spouses were treated to a twin program feature at their spring dinner meeting in St. Petersburg, Florida. A record turnout heard from M.I.T.'s Dr. William W. Seifert, Professor of Engineering, Urban Systems Laboratory, and Mr. Rene Crouch, of the J. E. Grenier Company of Tampa.

Professor Seifert presented Project Bosporus, a study done by one of his classes to project a course of development for Boston's transportation facilities (see *Technology Review* for February pp. 85-6).

Second on the agenda was Mr. Crouch's presentation of proposed plans for a multi-million dollar jetport to be built at Tampa International Airport. All the work behind the plans for this airport demonstrated in reality the many problems and solutions presented by Project Bosporus. Mr. Crouch showed us the airport's incorporation of several new concepts including "horizontal elevators" and multi-level vertical parking within the terminal building. Stressed in the design is traveler convenience with emphasis placed upon short walking distances and planned flow of passengers and baggage. Another design emphasis is on the handling of "super jets" which may be with us very soon.

Alumni Advisory Council: Say "There's Trouble and I'm In It"

Jerrold R. Zacharias, Professor of Physics at M.I.T., started the year determined to learn more about today's generation of students.

Now he knows. "They are troubled by the same things we are, but we live with these things too easily," he told the Alumni Advisory Council this Spring.

Professor Zacharias chose an undergraduate seminar as the format for his "learning" experience, and throughout the year he, Mrs. Zacharias, and some seven M.I.T. undergraduates have been meeting once a week from 7 to 10—or midnight, or later. Together they have shared their frustrations and concerns, coming to a common understanding



Eight M.I.T. alumni from Contra Costa County, California, met for dinner at the Concord Inn when this picture was made to hear a report on M.I.T. affairs from T. Guy Spencer, '56, then Associate Director of the M.I.T. Alumni Fund. Left to right, they are: Joseph P. McBrien, '31, James W. Goodhue, '43, Herbert A. Newey, '41, Harry J. Sommer, '37, J. Warren Evans, '39, Karekin G. Arabian, '37, Waite H. Stephenson, Jr., '45, and Frank G. Marble, '35.

which the students will remember at least as long as they remember any part of their college experience.

"We've talked about all the things that make you feel as if somebody ought to do something about them," said Professor Zacharias. And we've discovered, he said, that "a long list of things is worse because you want to do something about everything at once. It's more than a man can stand," he said.

Examples: "I never before heard anyone talk about the nuclear stand-off in a simple way: any nation that pushes the button on a nuclear war is killing itself. We're all in one big gas chamber. . . . There are times when you have to commit immoral acts. War is always immoral. But there can be no justification for a foolish immoral act. . . . The arms race is over. There is a complete saturation—whether you have 10 overkills or 15 doesn't make any difference.

"There is a mess. The public is not lavishing attention on serious issues. So why should anyone listen to authority for the sake of authority. If you stand up and say, 'I spend my energy on one of these great issues,' the students will trust you. But be sure you speak from a podium that gives you the privilege of saying, 'Yes, there's trouble and I'm in it.'"

"Are we immune to the kind of soul-aches the students feel?" Dr. Zacharias

asked his audience, which included the students in his seminar who were invited as special guests. "Are we out of hope—too far from the gut feelings the students have?"

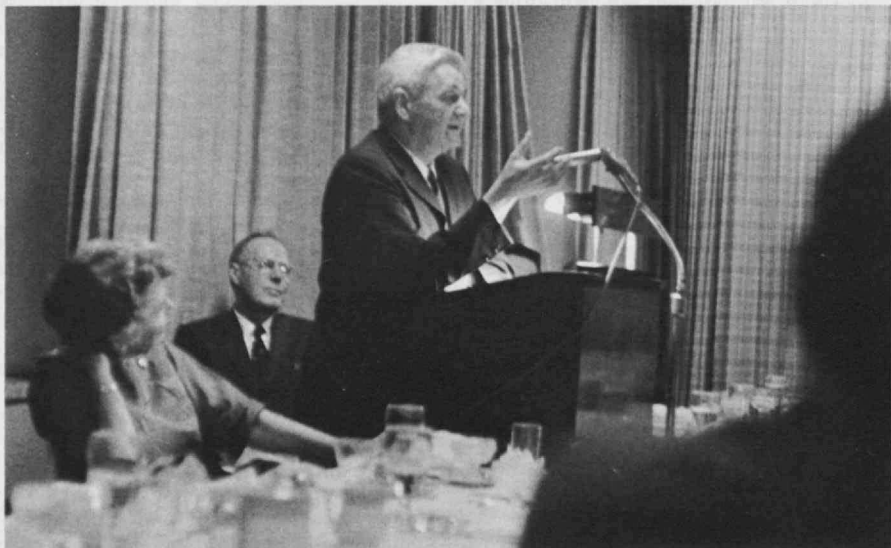
Perhaps you are, said Peter Q. Harris, '69, one of the students. "Experience can lock you into a way of looking at things, just for the sake of the way it's always been done."

"What bothers me is that when I ask a question I get no answer," said Robert A. Schaeffer, '69. "You are not looking at our questions but only at why we are asking them," he told the up-tight alumni.

Deceased

Howard I. Wood, '01, May 6
Harry J. Lohbiller, '01, September 19, 1961
Edwin E. Nelson, '02, April 6
Melvin H. Schwartz, '04, April 7
J. Wallace Taylor, '05, August 7, 1968
Frank A. H. Kelley, '06, December 31, 1968*
John R. Randall, '07, April 28
Arnold W. Heath, '08, March 5*
Robert W. Bayle, '10, August 6, 1968
Curtis M. Hilliard, '10, May 14
Manson A. Lyons, '10, February 10, 1965
Clyde F. Smith, '12, April 24
Leigh S. Hall, '14, March
Douglas B. Baker, '15, May 4*
Tharratt, G. Best, '17, March 27*
Philip M. Dinkins, '18, April 25*

J. Sidney Marine, '18, May 13*
William F. Lawrence, '21, April 15*
Kenneth M. Moore, '21, April 30
George S. Safford, '21, February, 1968
Herbert Von Thaden, '21, February 8*
James H. Allen, '22, April 3
Henry W. Coughlin, '22, October, 1968
Edwin D. Martin, '22, November 12, 1968
James Nesmith, '2d, '22, May 19
Leonard P. Botting, '22, May 8
Charles Shilowitz, '23, September 25, 1968
Peter V. Martin, '23, May 9
Charles E. Lanyon, '24, February 12
Harold E. Bawden, '25, August 10, 1968
George C. Caine, '25, February 10*
Henderson L. Holman, Jr., '25, December 27, 1967
Lewis M. Van Gieson, January 18
Bernard J. Hogue, '26, January 5
Allston D. Calhoun, '27, February 23
Francis H. Littrell, '27, June 25, 1968
Vincent Caputo, '28, April 22*
Sol Horwitz, '29, May 19
Hemenway R. Bullock, '29, January 22
Edwin V. Hill, '30, March 4
Edgar W. Sniffen, '31, February 4
Percival B. Elbaum, '31, April 22
Richard B. Sheridan, '32, July 1, 1968
R. Vincent Kron, '37, April 14
Walter B. Moore, '37, May 5, 1967
Wilfred Merchant, '39, October 12, 1965
David B. Moyer, '43, March 28, 1969
Kenneth B. Tuttle, '46, December 30, 1968
Gerald F. Laufs, '52, January 5
Andrew W. Edwards, '53, March 10
Francis H. Molin, '62, January 29
Jay Davidow, '67, February*



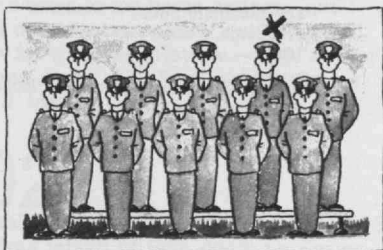
Ralph H. Davis, '31, Vice President of the Alumni Association, introduced Jerrold R. Zacharias, Professor of Physics, to the Alumni Advisory Council in May as "M.I.T.'s greatest teacher." In his preamble Dr. Zacharias showed one of the reasons: "Every time someone under 26 says something, you've got to listen," he said. "There's gold there!"

HISTORY in brief

Class Secretaries are historians. Collectively their monthly columns present a capsule history of the entire alumni body. Here, in the fortunes of one imagined alumnus, is the story of many.

The '60s

Joel Smith reports that he ushered at the recent weddings of both Jim Everest and Marv Morgan. Joel is a 2nd Lieutenant in the USAF stationed at Wright Patterson AFB and is still enjoying single blessedness.



The '50s

Joel Smith, former manager of manufacturing for the Exactron Corp., has been appointed Vice President of marketing



for Maxon Carboly, Inc. Joel and his charming wife, Doris, have four children, two of each, and the welcome mat is always out for classmates passing through Atlanta, Ga.

The '40s



Joel P. T. Smith
....elected

The Wall Street Journal reports that Joel P. T. Smith, president of Telespectrum, Inc., has been elected to the Board of Trustees of Am. Mutual Mortgage Investors, Inc., (AMMI).

The '30s

Board Chairman Joel P. Thornton Smith of Telespectrum, Inc. (TELSPEC), has been re-elected president of the Valley Pond



Hospital. He hopes to be with us at reunion, but adds cautiously, "God willing".

The '20s

From Joel Smith: "Retired and really enjoying it. At our 35th wedding anniversary we had the whole family with us."



The '10s

With his \$5 class dues, Joe Smith sends word that he and Doris are just back from an East African safari with lots of pictures. Joe says he has good shots of some of the native belles. They're still undeveloped, but he's going back next year. What a guy! What a class!



The '00s

One of the sorry tasks of a class secretary is to report the passing of classmates. Last month, at his winter home in Sarasota, Florida.....

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Class Review

95

With only two of us left there is not much to write about. However we do wish you all a good summer with many happy memories of your reunions.—*Andrew D. Fuller*, Secretary, 1284 Beacon St., Brookline, Mass. 02146

98

Your Secretary is away again visiting various beaches with the Airstream trailer. Mr. Jones retired in June from teaching at the Springfield High School of Commerce. In the fall we expect to travel in Canada southward, to follow the changing colors of the foliage. Hope to find a letter from you waiting for me. In the winter we plan to explore the southwest, a section of the country we have not seen. I am giving up most of my volunteer services; so you see, we have both retired in order to enjoy travelling. Please send news to my home address, and I will continue secretarial duties when I can for the Class Review.—*Mrs. Audrey Jones Jones*, 232 Fountain St., Springfield, Mass. 01108

02

A note has been received from Mrs. E. E. Nelson telling of Ed's death on Easter Sunday, April 6, after a long illness. An obituary was thoughtfully enclosed and it is given below.

"*Edwin E. Nelson*, 89, of 46 Roberta Ave., Pawtucket, the former general superintendent of the Blackstone Valley Gas and Electric Company, was stricken at his home early yesterday morning and died before arrival at Memorial Hospital in Pawtucket. He was the husband of Eloise (Jones) Nelson. Born in Lowell, Mass., he was a son of the late Clarence and Winifred (Dearborn) Nelson. He was educated in the Lowell schools and at Mass. Institute of Technology, where he re-

Copy for this issue of *Technology Review* was due from your secretary about May 20. Information reaching him after that date will be reported in the first issue of volume 72.

ceived a bachelor of science degree in electrical engineering. Throughout his career he was associated with the utility holding company of Stone and Webster. He worked in various parts of the country before coming to Pawtucket and Blackstone Valley Gas and Electric Company in 1918. He retired as general superintendent in 1950. The Company was later split into the present Blackstone Valley Electric Co. and Valley Gas Co. Mr. Nelson was a member of the Providence Engineering Society and the M.I.T. Club of Rhode Island. He was a 50 year member of the Fort Worth Lodge No. 148 A.F. & A.M., a member of the Dallas consistory of 32nd degree Masons, and a past patron of the Keystone Chapt., Order of Eastern Star, of Fort Worth. He attended Pawtucket Congregational Church. Beside his wife, he is survived by a sister, Mrs. G. Tappan Little of Lowell, and several nieces and nephews."

Father Time has scythed us down to 23 living members of whom 12 live in Massachusetts.—*Burton G. Philbrick*, Secretary, 18 Ocean Ave., Salem, Mass. 01970

03

We offer more of our much revered class news for our remaining classmates, who have now passed their 65th reunion and are yet eager to learn of their classmates' careers, so long in abeyance. Accordingly, your Secretary has acquired the welcome biography of our loyal classmate, *William C. Lounsbury*, Course VII, of 1516 West Court St., Jamesville, Wisc., through the opportune assistance of his loving daughter, Virginia Lounsbury Gibson.

"It is at the request of my brothers and sister that I have attempted to satisfy in part their desire to put in writing an account for future generations, of some accomplishments of my dear father. *William Cotton Lounsbury* was one of seven children, six boys and one girl; he was born in Brooklyn, N.Y., Friday February 13, 1880. Father spent his early life in Boston, Mass. He attended Allston Grade and Brighton High School and entered M.I.T. graduating with a major in the biological sciences and engineering.

"The following year was spent as a private assistant to a professor at Worcester Polytechnic Institute, in chemistry, bacteriology and sanitary engineering. He next was employed as Scientific Assistant in the U.S. Bureau of Chemistry in Washington, D.C. In 1906, while an employee of a New York engineering firm, he was sent to Wisconsin, to supervise construction work for the Superior Water, Light and Power Company.

"In June 1908 he married Genevieve Eaton of Superior, Wisc., a graduate of the University of Wisconsin and a Pi Beta Phi. Father was destined to be with the Superior Power Company by serving in various capacities, including General Manager, until 1935, when he was transferred to the Minnesota Power and Light Company as safety director and personnel director until voluntary retirement in 1949.

"The following years, father and mother enjoyed making new friends and acquaintances at Fort Myers, Fla. They became active citizens in all social, church and civic affairs until 1966, when due to health reasons they returned to Wisconsin. Father was always interested in public health. In 1910, he organized and was President of one of the earliest anti-tuberculosis branches of the National Association.

"In 1911, he published a report read at the annual convention of the Wisconsin Engineering Society, held in Madison, Wisconsin. The *Annals of the American Water Works* contain several of such reports. Father was active in construction work aimed at sanitizing and beautifying conditions in Superior, Wisc. He was an active member of the Park Board and as chairman was instrumental in developing its present beautiful park system.

"Mention should be made of his being elected a Fellow of both the American Association for the Advancement of Science and American Public Health Association. He served as President of the Rotary Club and while Director, 'Poet Laureate' at Duluth, Wisc. He was also President of the Wisconsin Electrical Association and of the Great Lakes Division of the National Electric Light As-



W. C. Lounsbury, '03

sociation. Several of these associations have made him a life member.

"While busy with his engineering career, father enjoyed his Masonic Activity and was a member of several Lodges including the Shrine. He was also active in Y.M.C.A. and Boy Scouts. Though busy in his many activities which included public speaking, father found ample time for his devoted wife and children. At present time, beside his two daughters and three sons, he has seven grandsons and eight granddaughters plus five great grandchildren.

"Father has always enjoyed his ability to write poetry—over a hundred poems appear in a booklet which is welcome to his cherished classmates and future generations of his family."

William A. Howell, Course VI, 8 Court St., Farmington, Maine, passed away on January 21, 1969. He died at a rest home in Farmington where he had lived for several years. Born in Andover, Mass., son of John and Mary (Allen) Howell, he was educated in the Andover, Mass., public schools including Pynchard High School in preparation for entering M.I.T. William was a good construction engineer most of his life yet found time to enjoy membership in the Masonic and Odd Fellow organizations. He is survived by a sister, Mrs. Thomas P. Dea of Andover Mass., a brother, George Howell of Kelowna, British Columbia and several nieces and nephews.

Walter P. Regestein, Course V, has a new address, Plaza Apts. 1303 Delaware Ave., Wilmington, Del.—**John J. A. Nolan**, Secretary and Treasurer, 13 Linden Ave., Somerville, Mass. 02143

05

To those of you who are Masons, I proudly announce that on Saturday, May 17, at a Grand Lodge meeting in Manchester, N.H., I received my 50 year pin and badge, the Grand Master doing the pinning. Since I was 36 years old, when I was "raised" I had fondly hoped, but never quite expected to make it.

In a letter enclosing dues, **George Rhode's**, Course VI, allows the inference

that he had been in the emergency ward of the Mountainside, N.J. Hospital a short time ago. It does state that he has returned home and is back to good health, considering. As to dues, on which you received a request, over 60 per cent have responded, giving us a balance to help your secretary hunt and probe for news.

Hal Robbins, Course I, is (May 20, 1969) on a trip to Portugal and Spain. That certainly proves that he is something more than ambulatory, probably pretty husky. . . . Through Elizabeth Babcock (Mrs. Courtlandt) I have received a clipping from the *Beth Israel Hospital News* telling us that **Myron** (and Rose) **Helpern's** daughter, Mrs. Sidney Stone-man, has been elected to the chairmanship of a very important committee at the hospital of which her husband is First Vice President. To list her other community services would consume more space than we can spare, but it is obvious that Myron and Rose have helped provide the kind of service they have previously contributed bountifully.

Gil Joslin, Course XIII, writes of his winter in Florida. (These bachelors do seem to get around.) "My sister and I were at the Seminole Hotel in Inter Park, Fla., where we have been going for about 20 years. It has a good location on a lake and a regular happy family as most of the guests have also been coming for years. We went down on December 3 and came back on April 8. It is only 60 miles from Daytona Beach and we get over there occasionally. We had the coldest winter in 20 years but no snow and not even a frost. The sun was warm but always a cold wind. My health has been fair but I have had diabetes for several years although I still get by with pills. My eyes have been going bad for some time and I decided it was not safe to drive so I have just sold my car. I will miss it as it will be the first time in 50 years that I have not had a car."

Prince Crowell, Course X, writes of his wife's (Ethel) accident: "December 5 Ethel broke her hip and has been laid up ever since. They used the ball and socket method rather than the pin. After several weeks at Falmouth Hospital she was moved to Royal Megansett Nursing Home for a couple of weeks, then home. I am the nurse morning, noon and night, but we have a housekeeper. Ethel has given up the 'walker' and now takes short walks in the house, holding on to my arm. She can stand alone and moves about a little holding on to the furniture. I hope in a couple of weeks she can use a cane. I have walked outdoors with her twice. If good weather comes we will walk out every day. She still has lots of pain, not from the hip but from her muscle. Of course we couldn't get to Florida but I have enjoyed being here but haven't had time to work much on my boats." I hope Prince will be able to get at his boats for the racing season or the south side of Cape Cod will be a bit tamer without Commodore Prince at the helm of one of the winners. I have a bit

of news of **Huntington Smith**, 1332 Quail Drive, Sarasota, Fla., 33579, which I needed because I have felt since the announcement of the death of Mrs. Edith Wheeler Ripley, that "Hunt" is the oldest member of the class. That is now confirmed. He will reach his 92d on August 9, 1969. He writes, "I realize now that it is not too much fun; one has to give up so many things, such as golf. I took pre-med studies before entering M.I.T. and decided I wasn't cut out for the job."

Fred Poole, Course VI, says: "The only name missing from the list, as far as I know, is your own! If you still belong, that would total 48 names. The book *Biological Time Bomb* states that there are 12,000 people in the U.S. who are 100 years old, or older. I wonder how many of our '05ers will make it. I have a brother-in-law who is already 99, but he is a Harvard man. Perhaps they last longer." I will have to ask Fred to explain that last sentence. We are supposed to be nice to Harvard now. . . . **George W. Prentiss**, Course II, says, "Am still alive, although I don't jog for existence." I hope that means that he could, if he wished.

Sam Seaver, Course XIII, writes from Markham, Ontario. "Your plans for June reunion should bring a good turnout and I hope it does. However, I'm sorry that I will not be able to attend. June is just about the worst time of year for me to get away. Especially this year as I have a deal on for some of my property. The sale has been made but certain conditions have to be passed by the road department, Markham Township and the Municipal Board of Metro Toronto under whose jurisdiction we come. I hope everything will be settled by July as we are planning another trip to the coast. This time by car as my son being a professional photographer is going on a scenic tour. I also, being an amateur photographer, will take both stills and movies. We will go to Sacramento where we have friends and then up through northern California and on through to Vancouver; then back home via Canada. There will be three of us in the party—Sam, Jr., and my wife. In any event we will not leave until August but even if the deal is not cleaned up by then, will go in September or even October, but July is the time we would like to go. We will travel by car as, of course, Sam's photo equipment takes up too much room for the plane. So here's to a real good reunion in June. Wish I could be with you. Goldy—the ex-president makes me laugh with his approaching inflation. We have had inflation since I was a kid when eggs sold for 5 cents a dozen, milk went up from 8 to 11 cents a quart and meat from 18 and 20 cents a pound to 25 cents."

I am sorry to have to report that the Executor of **J. Wallace Taylor's** (Course II) estate informed me that Wallace died on August 7, 1968. This could mean a lack of survivors, but I hope to have more news for the next issue.—**Fred W. Goldthwait**, Secretary, Center Sandwich, N. H. 03227; **William G. Ball**, Assistant Secre-

06

Early in April came a report of the death on December 31, 1968, of *Frank Augustus Hayward Kelley*, Course I, in the hospital in Fairmont, W. Va., where he had lived since August 1917, when he became an employee of the Monongahela Valley Traction Company. He retired in 1949 after 32 years of service as Engineer, Maintenance of Way; Chief Engineer; and Civil Engineer in charge of surveys, drafting, and designing. Being a registered professional engineer in W. Va., he was a charter member of the Fairmont Chapter, a member of the National Geographic and various other societies, associations and clubs, including the M.I.T. Club of Western Pennsylvania. After being honored by the Fairmont Chapter in 1953 as "Engineer of the Year", he was the first in the state to be elected to life membership in the state society (of professional engineers). Being active also in church and civic affairs, he was awarded in 1967 a fifty-year diamond studded service pin by the Monongahela Power Company. For the first 10 years or more Frank worked as a civil engineer on the location and construction of railroads and highways in Maine, West Virginia, Tennessee, Texas, North Carolina and Virginia. How Frank did get around! On September 27, 1910, he married Lalla Lyle in Johnson City, Tenn. She died in 1967 and they had no children. A niece, Mrs. Elmyra Jamison, had made her home with the Kelleys in their declining years and I am indebted to her for all the above details. She kindly answered a note of sympathy I had sent to "The Estate," and sent me an obituary.

The list of deceased on page 97 of the *May Review* contained one '06 name—*Herbert Lawrence Williams*, Course III, on December 25, 1968, his address then being Glen Head, N.Y. Wee, as he was called, was born July 9, 1884, in Newton, Mass.; he attended the Newton schools and got his degree in mining with us. His thesis, with George Henderson, was "Investigation of Static Concentration of Ores." Wee was one of the most popular and most active men in the class, being a member of K₂S; Osiris; Bergwerker Verein; Mining Engineering Society; Technology Club; Technique Electoral Committee; Junior Prom Committee; Vice President Institute Committee; Advisory Council on Athletics and Vice President Athletic Association; Varsity Relay and Track Teams all four years; Junior Class President and Senior Class Director; Third Marshall Class Day. In spite of all that extra-curricular activity Wee earned his degree. Like other miners, his first jobs were in the mines in Sonora, Mexico. In 1913 he was with the Stearns Roger Manufacturing Co., in Denver but soon joined the Empire Zinc Co., in Salt Lake City, then the New Jersey

Zinc Co., in New York City, and later another zinc company in Depue, Ill. However he quit the zinc business and got into conveyors in New York City, retiring in 1957 to live in Glen Head.

Early in May Anne and *Bob Rose*, Course XIII, drove up from Marblehead for a visit with us and we had lunch at the Wellesley College Club overlooking Lake Waban. We have recently talked with Bertha and our Class President *Sherm Chase*, Course XI. Sherm like most of us, has "slowed down"—doesn't attend meetings in town and reluctantly passed up a professional meeting in Vienna. He represented the Class at the Council Meeting in May. After that dinner the talks and discussion by Dr. and Mrs. Zacharias and a group of students ranged over various topics, the Sakharov Paper, the decision to drop the bomb, student dissent, etc. Fortunately that "dissent" hasn't been violent on the M.I.T. campus—yet!

Chester Hofer, Course I, and Ruth Ella have been doing a mighty fine thing for his hometown of Freeport, Ill.—they offer prizes each year to Junior Historians of the grade schools who write of the local history of Freeport where the Lincoln-Douglas debates were held so long ago. When the Rotary Club of Freeport celebrated its 50th they found that Chester was the only living Charter Member and asked him to report on the twenty years he had visited Rotary Clubs in six countries. Chet didn't send a copy of that report, which I'll bet was very interesting.

Have you been away lately? Be sure to send me a note or card when you are off somewhere.

Just as these notes were being typed we received a long letter from *George Guernsey*, Course VI, who has been a permanent resident of Sarasota for the past few years. George enjoys lawn bowling and shuffle-board. He "managed to win two 'runner-up' trophies during the winter season in lawn bowling," and does a half hour "shuffling" each morning—has quit golf. His daughter Helen had visited him from Seattle, and Mary from Wilmington. He expects Betty and family will be on from San Jose this summer. In answer to my question George says "prospects of going north are very slim." I wonder who we will see on campus on Homecoming Day June 16?

One change of address to report—*Charles E. Abbot*, Course XIII, now lives at the Chateau Club, 2151 Gulf Shore Blvd. North, Naples, Fla.—*Edward B. Rowe*, Secretary-Treasurer, 11 Cushing Road, Wellesley Hills, Mass. 02181

08

Further information has been received since our previous report on the death of our faithful secretary *Harold Leston Carter* (82) on February 23, 1969. He died

suddenly of a coronary occlusion. He had lost his wife Helen in 1953 and had since lived alone at 14 Roslyn Rd., Waban, Mass.

He graduated from the Boston English High School and from M.I.T. in 1908. He joined the Boston Mutual Fire Insurance Co., upon graduation and remained with it until retirement in 1951. He was a life member of Revere Lodge of Elks, Royal Arch Chapter of the Shekinah, Omar Grotto, the Massachusetts Consistency of 32nd degree Masons, Boston Chapter of Royal and Select Masters, Bethelm Lodge of Masons and the Aleppo Temple.

Had a nice letter from *Robert Amory* who is listed as a member of '08, although he was only with us a year before transferring to Harvard where he graduated. He was a director of the Arkwright Boston Mutual Fire Insurance Co., a part of the Boston Mutual Fire Insurance Co., of which Carter, our late class secretary was Vice President. He became a partner in 1918 of Amory Brown a cotton textile commission house; Treasurer of the Nashua Manufacturing Co., in 1927, and President and Treasurer of that company in 1931. In 1947 he became Vice President of Springs Cotton Mills and executive Vice President of Springs Mills when they combined with Springs Cotton Mills in 1968. He retired in January, 1968 and moved to Boston.

Alfred B. Babcock of Darien, Conn., has been 47 years with the American Sugar Co., Brooklyn Refinery (36 years as General Manager). He is in his 84th year and has been a retired executive for 12 years. His health is good except that he had a heart attack at the time of his retirement so he does no heavy work. When not otherwise busy his time is spent reading. One hobby is photography; he does his own developing and printing.

His most important occupation is weaving products all the way from small items like towels, place mats, and napkins up to materials 36" wide, such as upholstery fabrics and bed spreads. He reports that weaving is fascinating; the finished work is generally much more satisfactory than purchased material because of the special design, quality and saving in cost. It is all a lot of fun.

We have a nice report from *Gregory M. Dexter* of 32 Fenmore Rd., Scarsdale, N.Y. The following are excerpts from his letter: "I graduated from M.I.T. in '08 in civil engineering and later got a degree in mechanical engineering at Brooklyn Polytech. My main experience has been about 25 years with two companies in the sugar industry.

"I married a graduate of Barnard College and we have three children. I have been active in the American Society of Mechanical Engineers, being a member for the past 50 years. I was on the Admissions Committee from 1961 to 1966 and was its chairman from 1965 to 1966. I then was elected its Fellow in August 1966."

From *Wilfred Booth* we have learned of the passing of *Arnold W. Heath* in Seattle, Washington, on March 5. Arnold, a civil engineer, is survived by his wife who is now living at 207 Circle Drive, Panovana City, Olympia, Washington.

Now that we have lost *H. Leston Carter*, our class secretary, no plans have been made to hold a 61st reunion at the Melrose Inn in Harwichport. Several of the class will gather there on June 13 to 15 as usual and we hope that others will join with us this year. Then back to Cambridge for Class Day June 16.—*Joseph Wattles, 3rd*, Acting Secretary, 26 Bullard Rd., Weston, Mass. 02193

09

These are the last class notes until the October-November number of the *Review*. Since the copy for them was mailed over a month before the reunion, we are unable to make any comments on this event until the fall number. When this, the July *Review*, is received by the Class, those who attended will know all about it though we plan to report in some detail for the others.

On the return-card received from *Kenneth J. Campbell* he states: "Sure would enjoy being with you all and greetings and best wishes to all." He still lives in Sioux Falls, S. D., but his new address is 1000 North Lake Avenue—57104.

George E. Hodsdon states that his wife passed away recently so he sold his home in Gloucester, Mass., and now lives with George, Jr., at 1242 Plumosa Drive, Fort Myers, Fla., 33901.

Mrs. Turner of 451 Beacon Street, Boston, states that her husband, Dr. *Henry C. Turner*, died on January 19, 1969. Almost since graduation from the Institute the Turners have made their home near Boston and since 1925 have lived in Boston on Massachusetts Avenue and Beacon Street. We are writing to Mrs. Turner expressing our sympathy.

As usual at this time the class officers wish everyone a most pleasant summer.—*Chester L. Dawes*, Secretary, Pierce Hall, Harvard University, Cambridge, Mass. 02138; *George Wallis*, Assistant Secretary, Wenham, Mass.

10

Achilles Hadji Savva, Hotel Palladion, Athens, Greece, writes that He received my notice of our 60th reunion next year. He says, "I have received your letter asking for my dues on the occasion of the celebration of our 60th reunion in June of 1970 and feel so glad being able to participate, in some way—be it mentally—age being a serious impediment for my personal presence in the midst of my classmates to whom I request you to transmit my hearty greetings on the same day of the reunion. My wife and myself feel so sorry that age constitutes some

impediment for your visit to Athens."

Walter Swindell Davis, Palos Verdes Estates, Calif. writes: "Certainly some members of 1910 who know me have been to California—don't forget my address for I'd like to see you again and talk over old times."

Walter T. Spalding writes from Honolulu, Hawaii: "We all thank you and *Jack Babcock* for starting work on our 60th reunion on the campus 14 months hence and Romalda and I plan to be there with you. We shall be in Worcester where Romalda will be teaching a class of teachers at a college (for the 4th summer) from June 30 to July 12 this year, so we hope to be in Boston and to see you there then. We shall spend a week or two at work in New York either before or after the class in Worcester. Our publishers have just written that our draft of the third edition of our book, which we completed last month, is accepted and now with their production department, so the galley proofs which we must correct will be ready about then. We are very well but both could use a holiday. This new edition does not change the Spalding method of teaching but simply deletes some discussions and letters quoted while adding many useful teaching techniques. The book has sold about fifty thousand copies in the 10 years since our first edition, and is still selling well, and all without commercial promotion. Now we expect to promote this proven method of teaching all to write and read and spell English in their early years. It's a worthwhile objective in these illiterate days. I am still grateful to Professor Arlo Bates, among others. It happens that he also taught my mother in East Machias, Maine many years before me.

Albert K. Huckins, Rockport, Mass. writes: "Good to hear from you. We are indebted to the class officers who so faithfully serve the class. Frankly I am surprised that there are 125 members still living. I suspect a reunion on campus will meet with general approval. Enjoyed visiting you at your office last October and meeting your son. How nice for you he chose to follow in your footsteps. Although I was in Boston again in March, appointments took up my time. The winter was an interesting one in Rockport. No snow until February enabled me to enjoy many long walks along the shore. February was exciting with its wild storms and loss of power at times. Snowed in from Monday to Friday, one time."

Catharine B. Bowen writes that her father, *Manson A. Lyons* passed away on February 10, 1965.

Notice has been received that *Robert W. Bayle* passed away on August 6, 1968.

Mrs. *Carroll A. Sutherland* writes that her husband passed away last June.

Alfred Hague, Pompano Beach, Fla., writes: "Herewith I am happy to enclose my contribution to the 60th Reunion Fund

and hope that I will be able to make it. Mr. Seavey, '99, in Orlando, Fla., is planning to go back for his 70th in June. That is something to shoot at for the rest of us. In the March *Review* under 1912 class notes there was a paragraph headed 'Under Suspicion' referring to the December *Review* (See p. 121 for picture and story). He recalls that Harold Manson and Frank Bell pitched him up and over the heads of the milling gang so that he was able to crawl to the greasy window and obtain his copy. That was the 1911 *Technique*. That was absolutely true for I had exactly the same experience and result. Seeing that picture of the hut certainly rang a bell for me. I had no idea of entering the 'rush' with my 5 feet, 4 inches, so stood at the edge watching. Manson and Bell came along and said 'come on get into this thing' and with that they heaved me onto the top of the pile. I scrambled over the heads to the window and stuck my arm in waving it around in the dark until I felt a book in my hand. As I backed out many hands began grabbing my book so I just curled up around the book and waited until I came down to earth again. Eicher was absolutely right in his account for Arch and I were together in the window. All systems are still A-O.K. with me I am most happy to say. My problem is assigning priorities to the many things that I should be doing. If my ophthalmologist is correct I should be attending four more five year reunions."

French P. Sargeant, Clearwater Beach, Fla., writes: "Mrs. Sargeant and I have just completed ten years of retired living here on Clearwater Beach. I keep going on golf, shuffling and beach activities for exercise—just back from a trip in Mexico for variety—always go somewhere north during the summer to break up the long spell of hot weather here. We are doing all right."

John M. Gray, Boston, writes: "Time does fly and your reference to 125 members being Octogenarians makes me sit up and wonder how long we have to go. Outside of bad eyesight and very poor motion left in my legs, I am thankful for feeling good otherwise and take a short cruise every year and show up in the office every day. I look forward to being 'fit' for the 1970 Reunion."

Paul Hopkins writes: "Here is my mite and with grateful thanks to you all who have through the years held the good ship on course."

Guy Little's daughter writes that her father is in the hospital with a *serious* headache (Herkimer Memorial Hospital).—*Herbert S. Cleverdon*, Secretary, 120 Tremont St., Boston, Mass. 02108

11

I am now starting my fifth year as compiler of the class notes. In the past four years (36 issues) the names of 101 members of the Class have appeared in these notes, some of them several times. In ad-

dition, these notes have contained biographical material about 24 '11ers. The June notes were devoted for the most part to a plea for information about classmates' doings. More autobiographies are wanted.

In May I received a card from *Curtis Kinney* with an Apollo stamp with a "first day of issue" cancellation from Houston, Texas. It carried a picture of Curtis talking with Astronaut Borman about his encounter with the Red Baron in World War I. The picture was taken from an article by Curtis in the December, 1968, issue of the *American Legion Magazine* (mentioned in these notes for February.) More about Curtis's encounter with the Red Baron appeared in the July, 1968 issue of these notes.

A letter from *Sallie Denison* told of the death of her sister following a long illness. Her sister had been living with Sallie in the Wellsweep at Cornish, Maine since Dennie's death a decade ago. Sallie says that after the 1911 notes she always reads the 1907 notes which are written by Philip Walker who is her daughter's father-in-law.

Edward M. Suess' new address: Apardato 20, Bravo Sur 485, Saltillo, Coah., Mexico.

I have just heard of the death on December 15, 1968, of *Norman DeForest* of Maitland, Fla.

I had a cataract removed from my left eye in early April and am scheduled to have the other one operated on in the fall. As this is written (mid-May) Alma has an appointment to have both of her eyes done the last week in May. Here is hoping that we will both be able to see much better before long.—*Oberlin S. Clark*, Secretary, 50 Leonard Rd., North Weymouth, Mass. 02191

12

Do you remember the location of Course IV quarters on the top floor of Rogers. There were no elevators available so this location necessitated a long climb up three flights of stairs for all prospective architects. On this floor also were held the freshman classes in descriptive geometry under genial Professor Burrison. I recall that this drawing room was a gathering spot for news and sociability.

We dedicate this issue to our classmates in Course IV and have obtained contributions from nine men in this course of whom six are still active in their profession.

First is one from *Cy Springall*, a regular contributor to our column. "Eighty years ago I was born in the suburban city of Malden, Mass. After graduating from Malden High, I attended a preparatory course at Worcester Academy. I commuted to Tech via the five cent trolleys to Arlington Street, a few blocks from Rogers and made my daily climb to the

top floor. A few months before graduation, I secured employment with Kilbourn and Hopkins and took a few days off for graduation. I soon joined Parker, Thimas and Rice as specification writer and construction superintendent, where I remained till 1917. Then I enlisted in naval aviation, taking my ground school training at the new Tech which was building in Cambridge. After my discharge I opened my own architectural office on Boylston St., and pioneered in building apartment houses and shopping centers. Meanwhile, I designed several buildings at Logan Airport, and many churches, homes and miscellaneous buildings. I married a New York girl, but our marital happiness was soon ended with her death six months later. I then lived alone in a Malden pent house until 1927 when I married Marjorie, who has meant so much to me over many years. We have one son, Thomas, M.I.T. 1957, and one grandson, born last Christmas day.

Seven years ago I suffered a severe cerebral thrombosis which led to my retirement, and left me a cane-carrying cripple. However, I have refused to give up and am still active on various local projects, maintaining an architectural office in Malden. We have a quiet suburban home in Andover, Mass. and spend our winters in Scottsdale, Ariz. Marjorie and I still enjoy travel and are ready for trips whenever an opportunity knocks."

Al Harkness prepared at Brown University, 1909, and has lived in Providence most of his life. Last year he received a citation from the Providence Art Club. "As an architect in this community you have always been on the side of the angels, serving the cause of good design unswervingly." The closing paragraph said simply, "You have led the life of the thinking man." He also won the Providence Classical-Central Education competition, a father and son effort of his office. The project model includes a new Classical High School across the street from the existing Central High for which he designed additional buildings, also a boiler plant and two athletic fields. Although now 83, it is evident that Al is still most active in his profession.

A welcome letter has arrived from *Nelson Breed*, another of our still active architects. Nelson maintains an office in Wilton, Conn., and specializes in the design of churches and the better types of homes. He married for the second time in April, 1968 and he and his wife jointly have 12 grandchildren and one great grandchild. He is presently chairman of the Wilton Historic District Commission, which is active in preserving historic buildings and other spots of interest. As for hobbies, he enjoys all kinds of fishing, and particularly dry-fly trout fishing. He also does some skiing, though rather conservatively, and enjoys good music, such as that of the Philadelphia Orchestra, and the Philadelphia Ballet performances. Needless to say, his general health is excellent. He writes, "Soon I hope to take a trip to Greece among other places. Any architect of my vintage

who has not visited Greece should be shot, so I feel I should do something about it. However, for the last fifteen years I have spent a month or so each winter either in Jamaica or near Marco Island, Fla. I look back on my years at Tech as some of the happiest of my whole life."

Lee Bailey writes: "Ours was the first class in concrete design which had an intelligent course, so I took the engineering option in architecture. On graduation I worked on the design of the Harley Davidson factory in Milwaukee. After its completion I became an assistant designer for a Chicago firm specializing in concrete building design. At that time there was but one other similar firm in the city. In 1914, I formed a partnership specializing in engineering for factories and other concrete structures, but due to the depression we had to dissolve the firm in 1930. In 1932, I became associated with a firm where I took charge of their building design and construction. I retired in 1953, and my wife and I moved to Fort Lauderdale, a location which we have greatly enjoyed. We attended the fiftieth class reunion, and hope to go to the next one. Best wishes to all our classmates."

George Brigham of Ann Arbor, Mich., sends us a review of his activities from which the following has been prepared. After a short period in an architect's office in Worcester, Mass., he enrolled in Course IV as a special student. He then spent seven years with Boston architects engaged in the design of pseudo-Colonial buildings. He taught at Tufts College in 1918-1919, and at M.I.T. in 1919-1920. In 1914 he married Ilma Howe from his home town of Westboro, Mass. and together they restored a century-old Colonial house in Dedham, Mass. for their home. In 1920 he decided that the booming West was a better location for a young architect and moved with his wife and two children to California. He became acquainted with the architects in Berkeley, Fresno and Pasadena and liked their progressive ideas, which lessened the restrictions of the traditional disciplines in which he was trained. In 1923, he accepted a part-time teaching position at the California Institute of Technology and opened an office of his own for the practice of architecture. At this time the modern philosophy of architecture was just emerging and architects like Frank Lloyd Wright were attracting much attention. This stimulating environment encouraged him to work out his own new philosophy of design.

During the depression, architectural practice in the United States was almost nonexistent, so in 1930 George accepted a full-time position as an instructor in the College of Architecture at the University of Michigan. Here he was able to analyze the old concepts of architecture comparing them with the demands of modern life, and thus clarifying his new-found philosophy, which he has carried out in his practice. As Professor of Architecture at the University he said, "Architecture

is a life long study and a constant challenge. Meeting the needs of new social demands and making use of the new technology results in the creation of new forms." He retired from the University and has since been active in his practice of architecture, specializing in house pre-fabrication. He is a member of the American Institute of Architects, the Building Research Institute, the National Academy of Sciences and the Michigan Society of Architects.

Guy Swenson is one of our Course IV men who was a most active undergraduate. He was a member of the Glee Club for three years, in the Tech Show for two years, and played two years on the football team. He did not engage in the practice of architecture after graduation but returned home to assist in the family granite business in Concord, N.H., which was expanding rapidly under the guidance of his two older brothers. During World War I, he served as 1st Lieutenant in the Artillery Corps, where he met Gerald Howard, Course I.

On his discharge in 1919, he returned to Concord and married his wife, Mildred, of Cranston, R.I., in 1920. There were three sons and two daughters. All attended college and are now married. The girls live near Washington, D.C., and the three boys in Concord, N.H.; one a lawyer, and the others in the family business. Guy is now handicapped in getting about and has had several hospital sojourns. He has lived with his son, David, since his wife's sudden passing in June, 1968. He is still able to go to his office every morning, but does no travelling. He writes, "Of course I have had so many memories to look back on. I have been very fortunate." I am sure he would enjoy a visit from any of his classmates.

Here is an interesting story from C. B. (Carl) Rowley Course II., which rates a place in our Architect's Issue since he has spent most of his life as head of a firm of architects and engineers. "All of us at this age realize that the staircases get higher, the ramps steeper, and the time between steps when walking greater. After graduation, Clark, Ayres, Fox and I, with about \$500 apiece, decided to see Europe. We sailed on Friday, June 13th, and eventually arrived in Hamburg, Germany. After checking our baggage, we visited the second rate hotels to see where we could get the best room, which included a "Christian Science" breakfast consisting of a little juice, a small portion of butter, a stale and very hard roll, and a liquid they called coffee. We travelled third class and were gone three months. We visited Italy and went as far southeast as Budapest. I returned a bit early to work in the M.I.T. Heat Measuring Laboratory at a salary of \$62.50 per month, but managed to double this amount by doing outside work. I met Elizabeth Hosterman of Springfield, Ohio, a senior at Vassar, and this induced me to secure a more lucrative job on the new Fish Pier in South Boston. We were married in February, 1914, and Jane, the Class Baby, was born on Thanksgiving day.

"In 1915 we moved to Cleveland and I was set to go into the Army as a 1st Lieutenant to build cold storage warehouses in France, but was kicked out on account of my eyes. So I secured work with the Johns-Manville Co., and also with the government, visiting power plants to determine their fuel efficiency. I soon joined the American Fork and Hoe Co., as Assistant Chief Engineer in charge of remodelling and all new construction. I discovered that I needed architecture and went to night school. When State Registration was required I got registered, both as an Engineer and as an Architect, registrations which I still maintain.

"In the depression of 1921 the corporation reduced all salaries but I made a special arrangement to continue as Chief Engineer and still use part of my time for my own business. Surprisingly, this arrangement proved satisfactory and the architectural and engineering office of Small and Rowley was initiated. Fortunately, we secured contracts with the Van Swerigen Co., and did not only residence work, but also apartments and a country club. In 1928, I opened my own office and continued general architectural and engineering for many schools, factories, libraries and residences. I also maintained my connection with the American Fork and Hoe (now True Temper Corporation). All drafting work was done in my office. I have now sold three-fourths of the business to others, but continue to spend about half-time in the office and am on a True Temper pension. I take life easy so far as the office is concerned.

"We have three daughters and one son. Mrs. R. B. Snow, the class baby, is married to a lawyer, banker and insurance executive, and lives in Harwichport, Mass. They have one daughter who teaches school in Foxboro. The next daughter, Mrs. Geo. Collert, lives with her husband on a 1,000-acre ranch in California. They have 800 head of cattle and raise pure bred Hereford bulls. Our son, Charles, is a Boston broker with two children in college. Our youngest, Mrs. E. C. Tittman, has three teen-age daughters. They live in Darien, Conn., and her husband is an Olin-Mathieson executive.

"Knowing the Cape from college days, we rented cottages in and about Harwichport for many years. In 1938, we built our own summer cottage on the shore in this vicinity. We have since spent every summer there. We have added twice to the original structure to take care of our growing family. This year we plan to spend the months of June and October there, leaving the summer months to our family, as when the children take over, it is hardly a quiet location. As for travel, a little over two years ago we took a cruise from New York to the Scandinavian countries, then up the Rhine, through Switzerland, Paris and London. Last year we sailed from New York and returned via the Italian Line, touring Italy from Genoa—a marvelous trip. We shall probably stay in

Cleveland most of this summer unless something should change our plans. I will be delighted to see any classmate, and if we are at the Cape I am sure you can get your feet wet, and just maybe, you might get your throat moistened."

Charles Willis is another Course IV man who is still practicing his profession actively. He is living in a uniquely designed house in Lexington, Mass., which he built in 1931. Throughout his career he has successfully specialized in houses for young families, cutting their cost by developing efficient methods of construction. The interest in this design was demonstrated by the fact that an article written for *House Beautiful* received a record number of inquiries from readers. He has recently designed a type of construction different from any other, and claimed to be the most efficient. One of these homes will soon be built with the expectation that it will create a real demand. Only last fall his home was selected as one of the five most unusual houses in Lexington. Needless to say Charles is in good health and going strong.

We are sorry to report that Marcel DesLoge is not well. He was associated for many years with his brother Joseph, VI, 1912, as an executive with the Killark Electric Co. of St. Louis, but a few years ago he was stricken and forced to retire. He is now invalided and lives in a convalescent home. Letters addressed to 4616 Lindell Blvd., St. Louis, Mo. 63108 will reach him.

Howard Cather has written a note in order to conclude our News from Course IV. You will note from his biography in the December 1968 issue that Howard spent most of his professional life as a mechanical engineer with Eastman Kodak. He recalls that he enrolled in Course IV following a trip to New York where he was inspired by seeing the Woolworth Building, then considered one of the wonders of the world. He decided he would like to design a few like it and was told that Tech was the place to obtain the necessary training. He writes, "I well remember our structural architectural group was a fine one and Professors Chandler and Harry Goodman were excellent. I have a 1911 photo of the group showing twelve men, among whom were Lee Bailey, Marcell DesLoge, Cy Springall and myself."

J. A. Stratton Prize

We will all be proud to learn of the honor recently paid our illustrious classmate, Jerome C. Hunsaker, at a luncheon given him by the Friends of Switzerland Society. Jerry was a descendent of Swiss immigrants. It was he who, as a Navy officer, designed and built the NC4, the first aircraft to cross the Atlantic, flying from Long Island to Portugal in May 1919, eight years before Lindburg's solo trip. The flight took 19 days and included four intermediate stops; there was a crew of six. This accomplishment has received too little publicity but the plane has recently been rebuilt and placed in the

Smithsonian Institute, restoring at least a part of its rightful place in history. Jerry was awarded the Society's J. A. Stratton Prize for Cultural Achievement with the notation, "This man solved problems that permitted aviation to reach beyond the ocean. He has shrunk the earth."

Bates Torrey suffered a heart attack in January from which we understand he is apparently recovering quite well. Unfortunately however, his wife Alice, who has been a semi-invalid for years, has again had to go to the hospital and her condition is reported as serious. Bates is now living at home alone and would enjoy hearing from classmates. His address is 746 Stinard Ave., Syracuse, N.Y. 13207. *Paul Lawrence* and *Edna* have returned from their annual trip to Florida and report the poorest winter, weather-wise, they have ever experienced, probably due to the continued coolness. Last winter *Edna* damaged the ligaments of one knee due to a fall, and is still having trouble getting about.

We are pleased to receive good news from *Fritz Shepard* who reports that after a slow start, his eyes are now much better following a double cataract operation late last year. He also says that his rheumatoid arthritis has nearly cleared up after a siege of nearly two years. He is looking forward to an enjoyable summer. *Fritz* had recently seen *Al Davis* who says he is in good shape after his serious operation last fall. He is again active at the Algonquin Club. Our hearty congratulations to you both!

We have had a number of inquiries as to whether we are planning a 58th class reunion in June 1970. The general opinion seems to favor a location on Cape Cod in preference to another in Cambridge on the campus, where we met in 1965 and 1967. Each year is taking its toll of our classmates and 18 men have passed away in the last two years. However, the class roster still shows a total of 150 men of whom 96 were awarded degrees in 1912. If interested in attending a Reunion next year, we ask that you write and tell us so, stating your preference as to location. We shall then consult with *Al Davis*, who is our Reunion Chairman, and make the necessary plans.—*Ray E. Wilson*, Secretary, 304 Park Ave., Swarthmore, Pa. 19081; *Jay H. Pratt*, Assistant Secretary, 937 Fair Oaks Ave., Oak Park, Ill. 60302

13

When you read these notes Homecoming Day will be history and you will not hear from us again until October or early November. *William Mattson* writes another very newsy letter, relating to the arrival of "Spring in Colorado" with its green grass and rosebuds and other blooming bushes on the Mattson Estate. *Bill* is an old Republican from Massachusetts. Through his efforts he helped give our President Richard Nixon, Governor, and both Senators as well as a majority in the Colorado Legislature

(all Republicans) outstanding victories. Come back to Massachusetts, *Bill*, we need your help. Between his politics and his leadership in the guidance of the Red Cross organization, he is still one of our most active returnees. We are still looking forward to greeting both *Jo* and *Bill* at the next 1913 reunion, particularly the 60th. The Capens will surprise the Mattsons someday when they visit Colorado and Wyoming where your Secretary was born.

Keep those cards and letters coming, we enjoy receiving them. *Brenda Kelley*, the Review editor who edits all of the notes from the graduated classes, has advised that snap-shots or candid photos are very much desired to accompany class news. So, send in some of your experiences or hobbies with illustrations (glossy print photos).

Daggett sanctuary established

The *Vineyard Gazette*, Martha's Vineyard, Mass., has published that *Robert Daggett*, his brother *John T.* and his sister *Emma S. Daggett* are to contribute most of the land of Cedar Tree Neck as well as funds to establish the Obed Sherman Daggett and Maria Roberts Daggett Sanctuary which will include all of Cedar Tree Neck except the ancestral home and immediate acreage which is to be preserved in the family.

On May 7, an art exhibit was held at the Universalist Unitarian Church in Brockton of watercolor paintings and pen and ink drawings by *Henry O. Glidden*. We had hoped to attend this exhibition but a previously arranged engagement interfered. Good work, *Heinie*.

A note has been received from *Arlyle Cogan*: "We are still percolating. *Paul* had a bad fall some months ago—coming along now. Best regards to you both. A.S.C." Hope you are back in shape for 1973. We missed you two at the 55th.

From the Alumni Office comes a comment from *David V. Nason* in part: "I have been out of the Country for five months." What, more fishing *Dave*?

The American Chemical Society honored those who have been members of the Society for 50 years by presenting them with a special pin, badge, and a certificate that entitles them to free registration for all national and other meetings. Our own *William G. Horsch*, retired, Mobil Oil Corp., Woodbury, N.J., was one of the honored 50 year members. Congratulations, *Bill*. We have only one change of address *Ward C. Lovell*, 20 Mashnee Village, R.F.D. Buzzards Bay, Mass. 02532. Keep us informed of your activities, whether in retirement or still in business.—*George Philip Capen*, Secretary and Treasurer, 60 Everett Street, Canton Mass. 02021

14

Mrs. *John A. Root* has advised of the death of her husband on March 10,

1969, at Boulder Colo. *John*, a Course IV student, spent three years as a graduate student with '14. He worked after graduation for several years with the Cram and Ferguson Corporation, well known architects in Boston where later he was also a partner of *Downer* and *Root*. In 1965 he retired to the West where he had come from before entering M.I.T. The sincere sympathies of the Class are extended to Mrs. *Root*.

These notes are drafted in mid-May about a month before the scheduled '55th reunion. You are reading them about a month after the reunion. About 20 men and 15 wives are expected to attend. Considering the dispersion geographically not a bad turnout and the program that *Les Hamilton* and *Harold Wilkins* have laid out will, we are sure, tax them a bit, although pleasantly. A few of our Class have been fortunate enough to attend all of our 5 year reunions. I believe that our 5th reunion included a submarine trip.

Bob Townsend, who used to be a fairly close neighbor before we moved from New Jersey some years ago, sends this newsy note. "A few days ago, I heard from *Ben Rauber* that his wife died suddenly after an operation. A few years ago while *Ben* was closing up his office in New York preparatory to retirement, *Houston* went down to Cuernavaca, Mexico, where she designed and had built a house for their retirement. *Ben* joined her only a few months ago. The address I have is Apartado 863, Cuernavaca, Morelos, Mexico. . . .

"I also heard from *Bill Simpson* who had a serious heart attack on February 8. He wrote me that with the help of the doctor and three nurses he pulled through and is in fairly good shape (99 per cent recovered) but has to give up alcohol and is limited to two small cigars a day.

"In the '14 notes, I notice the biographical notes in some cases are a bit scanty. If you should want to know anything about me (which God forbid) I can refer you to *American Men of Science* or *Who's Who in Engineering*. I haven't been able to accumulate very much money but have had some interesting experiences.

"My Honorary Secretary duties have been changed slightly recently. In the past few years, I have covered about sixteen high schools in Northern New Jersey. In 1968-1969, I interviewed eleven applicants for admission. Of these, six were offered admission and I have hopes that four or five will make it. The Educational Council has decided to divide up my area (which is a good thing) and I will cover only Morristown and the immediate area from now on.

"We shall not be able to attend the reunion as we shall be on a trip via ship to the British Isles for about six weeks which comes at the same time. I hope things are going well with you."—*Herman A. Affel*, RFD 2, Oakland, Maine 04963

What made us the Class Supreme? Listen and you shall hear—on April 18 at The Chemists' Club in New York City 19 of us met for our annual class dinner. *Larry Landers* set this up for us and deserved the resounding applause he received for his time and effort in making this such a pleasant and interesting evening. After a cocktail hour, the old Pirate, still going on high, opened the dinner with his nostalgic "We are happy" cheer. Present were *Dick Bailey*, Philadelphia; *Phil Alger*, Schenectady; *Ben Neal*, Lockport, N.Y.; *Stan Osborn*, Hartford, Conn.; *Larry Quirk*, Middletown, Conn. Those were the really long distance men. Then from Metropolitan New York: *Jerry Coldwell*, *Alton Cook*, *Joe Livermore*, *Gil Peakes* and *Ray Walcott*; and over from Boston: *Larry Landers*, *Archie Morrison*, *Larry Bailey*, *Bill Brackett*, *Wally Pike*, Big and Little *Pirate Rooney* (Gerry is always a welcome guest), Admiral *Bill Smith* and *Azel Mack*. We greatly missed some of the regular attendees who could not make it.

Ralph Hart was laid up in the Columbia Presbyterian Hospital with a "pace-maker" heart operation. We signed and sent him a card with our best wishes for a speedy and complete recovery. This is the first New York class dinner *Ralph* has missed. A generous classmate, who wishes to remain anonymous treated us to wine with dinner—very nice! The post-prandial meeting in our upstairs headquarters room was as pleasant as ever. It was a gay, interesting and relaxing evening, typical of the wonderful spirit of closeness, camaraderie and friendship that has kept us together all these years and makes our Class so outstanding. For us from Boston, it's a yearly celebration—the train ride over and back, the comfortable Chemists' Club, the evening with classmates and the Saturday morning in New York.

Alice Anderson (Philadelphia) sent us a card from a long Caribbean cruise on the *Bergensfjord*. Oh, my! *Phil Alger* keeps active. He has just had two books published, *The Life and Times of Gabriel Kron*, a world famous electrical engineer, a pioneer in the use of computers and the invention of Diakoptics, and *Mathematics for Science & Engineering*, an extensive revision and expansion of Steinmetz's *Engineering Mathematics*.

Dick Bailey wrote: "I will be greatly pleased to see you and the Pirate, Ben Neal and our other classmates." Thank you very much, Dick. It's always good to see a really "old" guy like you and to hear your stories old or new, good or bad. *Elizabeth Baker* wrote: "How kind of you to get the '15 crowd' to write to Douglas. He appreciated it, but, of course, is not writing anyone. He has an unconquerable spirit." We all feel deeply for both her and Doug.

Professor *Lucius Bigelow* writes from Duke University, Durham, N.C.: "I am

presently moving into my as yet incompletely furnished retirement office in our new chemistry building at Duke. Since the close of my commercial consultation due to the cut-off of government funds, I have been offering help and assistance to students in elementary organic chemistry, free of charge to those who may request it. I am now proposing to expand this work considerably so far as health and strength permit. Mary and I are doing quite well, considering the advancing years and wish you all the best."

For my last winter's illness *Maurice Brandt* sent a cute get well card—a picture of a little monkey peeking out from under a front fold marked "De-Tails Inside." Turn back the fold and there he is hanging on a tree branch by his twisted tail and the caption "Get Well Quick." Thanks, Maurice. Another good wish from *Evers Burtner*: "I am sorry that you were ill and unable to make up the March Review. Mary and I have just returned from a short Florida stay. Altho' we were well down there, right after our return home we both got bad colds and the flu bug. However, given good weather, everything should look up. Best to Fran and you." With his dues *George Easter* wrote this fine letter. Thanks a lot, George. "Sure, your services are worth a contribution any old time so here you are, also a note to show what fools these mortals be. I think my wife and I are trying for the leather medal since for the last three years we have spent most of November and part of December in Florida (Treasure Island) and then headed for the Adirondacks for Christmas with our kids up there. This time we hit a temperature of 17° in South Carolina which was worse than we had in Buffalo till way into January. This year we cashed in on our memberships in A.A.A. On our way to the mountains, we were rolling along at about 60 to pass a station wagon load of kids when the dame driving it suddenly did a left turn across my bows into a drive. All I could do was head for a luscious snow bank which was as good as air brakes for stopping us. When I slid out of the car I went hip deep in a ditch full of snow with car wheels three feet in the air. Neighbors rushed out to patch us up; they called a tow truck and we were on our way in 15 minutes with no harm to anybody or thing. A.A.A. paid for that. Then the day after Christmas we planned to come home at 9 a.m. but in the cold my car wouldn't start. I personally saw the thermometer at -27° in the bright sun. Again called A.A.A. who worked over me for a half hour and finally pulled me a mile to a warm garage where they had me going by 1 p.m.—all at their expense. Garage man said it was 40° below at his place. Despite all the reputation Buffalo has, we have had almost no snow since early January. Thirty miles or so south of town is quite a ski area though—lots of it with man made snow—but never having learned to ski as a pup I still do not indulge. We had the pleasure of a dinner visit from Ben Neal last week and I gather he hit some of the super-snow down East. Ben is an active guy and a real go-getter as well as a fine fellow."

Otto Hilbert is feeling fine again after his recent cardiac upset and was leaving in April for the South Seas with a stop at Honolulu. With an unprintably large dues check, *Hank Marion* wrote from the Desert Club in Tucson: "Wish I could be with you all at the Faculty Club on the 11th but that is the day we expect to leave here to drive home so will be a little too far away to make the dinner. Please say Hello to all the gang for me, I'll be thinking of you anyway. I will be unable to be at the N.Y. dinner on the 18th. Please express my regrets to Larry and all of you attending and tell them I'll be with them in spirit. I am enclosing a small check to help oil the class machinery a little. You and Pirate and your loyal cohorts are doing a most outstanding job in keeping 1915 the 'Class Supreme' and I for one appreciate it very much. Virginia joins me in wishing the best of everything to you and Fran and we hope you are both in good health and keep that way." What a guy! Although he missed the New York and Boston (see below) dinners we certainly are looking forward to the great pleasure of seeing Virginia and Hank at The Class Cocktail Party here on Alumni Day, to thank him warmly in person.

At the time of our Boston dinner *Lucey* and *Harry Murphy* were in Phoenix, Ariz., visiting their married son who lives there. *Ozzie Osborn* wrote from Hartford, after his return from wandering around down south. "No more grandchildren or wives. Our rose breasted grosbeak has come back again, also the black cat and Income Tax Form 1090. I am again on the Public Health Committee of the Connecticut Medical Society and the occupational Disease Committee of the Hartford County Medical Society. I believe the prevention of disease is better than the cure. I hope you are well and expect no relapse." He's as funny as ever and a lot of you know what I mean. More evidence and proof of the Class Supreme.

On April 11 at the M.I.T. Faculty Club in Cambridge, 23 classmates and guests met for another big class dinner. Present were: *Frank Parsons*, South Yarmouth, Mass.; *Ozzie Osborn*, Hartford; *Wayne Bradley*, Moosup, Conn.; *John Dalton*, and *Pop Wood*, Peterboro, N.H.; and *Max Woythaler*, Framingham. Those were the long distance men. Then *Horatio Lamson*, *Larry Landers*, *Azel Mack*, *Archie Morrison*, *Frank Murphy*, *Wally Pike*, Big and Little *Pirate Rooney*, and Admiral *Bill Smith*. And our younger members, always welcome and who we are always glad to have with us: *David Hamburg*, *Herb Eisenberg*, *Jim Hoey*, *Jack Sheils* and *Bill Sheils*. Those long distance men practically stole the show! The lively, enthusiastic and enjoyable meeting opened with the old Pirate, leaping and landing lightly, leading a stimulating "We are happy" cheer. Cocktails and an excellent Bill Morrison dinner put us all in a relaxed and nostalgic mood. With our New York dinner the following week, we again have a glorious example of our outstanding class spirit. We spoke about our 55th reunion on the week-end

of June 12-15, 1970 at Coonamessett Inn, Falmouth, Mass., where we have been before on reunions. Detailed notices will be sent this fall. Plan for it and be there—we're not getting any younger. Jack Dalton closed the dinner with a hearty welcome to our younger members and some touching remarks about our splendid class spirit.

Of course, it's just impossible for me to acknowledge every class dues check, but I want you all to know I certainly do deeply appreciate your splendid and generous response: 109 dues for a 54 per cent return of our entire mailing list or 90 per cent return of our active list—those who have always paid dues and evidenced an interest in class and alumni affairs. Many thanks; you're a grand crowd of classmates. *Frank Parsons*, who recently moved from Pelham, N.Y., to 19 Marlin Way, South Yarmouth, Mass. 02664, was a newcomer to our Boston dinner and we were all glad to have him with us. He wrote: "I lost my wife in May, 1968, after two years of suffering from her auto accident. As she is buried in Brookline, Mass., which is nearer to my family than New York, I was induced to try Cape Cod and despite the terrible winter, I like it. I have six grandchildren in one family and three in another." With his dues to help the Class, *Ray Stringfield* wrote this nice letter. Many thanks, Ray. "It's a dirty trick to make the starving class of 1915 pay the postage, so I'll give you an extra check, and sorry I've delayed so long. It seems like life just goes around and around, and I still don't know enough to retire, but at least it keeps us on the jump so we know we're alive. As I guess you know, Bob Welles' wife passed away some time ago, but he keeps quite lively and gets out to all of the M.I.T. Board meetings and social affairs and still keeps his house in Pasadena. Bill Mellema's wife, Pearl, passed away in February, and Bill is not in good shape. Does not drive into town, and won't go out at night, and I'm afraid is pretty down in the mouth. In case you didn't get his address when he moved up from the beach, it is 4607 Hillard Ave., La Canada, Calif. 91011. Margaret admits it's tough being married to a chemical engineer, but she seems to be holding her own. We're sort of afraid to take any of the many interesting travel tours, as most of them require appreciable walking to see the sights, and my arthritic knee objects. If I'd lose 30 or 40 pounds, it might improve, but that takes won't power or something. We'll probably go up in the redwoods again this summer and just loaf and read Perry Masons. Best regards to you and Fran, and hope the trouble you mentioned in the March *Tech Review* has disappeared. Only the good die young, so don't be too good."

From Southern Pines, N.C., *Bur Swain*, who used to work with Larry in setting up our annual New York dinner wrote: "It's too far. Have fun, because there's nothing like it here. Regards to all." A great guy. *Ellis Tisdale*, true to his offer, sent us an oil painting copy of a small print of Hamilton Harbor, Bermuda, which we

sent him. Many thanks, Ellis, we're very proud of your talent. He wrote: "In return for one of his many books that Jim Tobey gave me some years ago, I'd like to do a picture for him. We see Bee and Charlie Norton from time to time. They are a great pair. (I agree with you.) And, unconditionally, you are the prize Class Secretary and it must be your hobby to keep the boys pepped up."

Before leaving West Palm, *Jim Tobey* wrote: "I am sorry to read you suffered from Taiwan flu and trust you are now restored to pristine health. The weather this year has been punk in Florida, but a little better than up Nawth." Ah, me! Good *Charlie William's* cheerful company was sorely missed in New York. He wrote: "I'm sorry I can't make the dinner. We're leaving on the 18th for a couple of weeks in California. The trip is tied in to meeting a number of relatives and we're taking one of our grandsons during his vacation, so we can't very well change the date. Our best wishes to you, the Pirate and everyone else and have a grand time. Best to Frances." Here's a friendly and sympathetic letter from *Pop Wood* in Peterboro, N.H.: "I was annoyed to read in our notes that you had been ill. You sounded healthy enough when I last talked to you. I am sorry not to have been down to see you, but it's because of the snow. I would love to have dropped in to hold your hand—the skin you love to touch (I never knew before that Pop really cared so much). You've got to take care of yourself as we need you for a good many reasons. I hope you feel that way also (I do). What a winter! It's March 21 and we still have about two and one half feet of snow left. My poor old ackin' back, I've done so much snow shovelling, plowing and blowing. We were two days getting out of our driveway. Anyway, that's country living for you—rugged and healthy. Do take care of yourself, Charlotte joins with me in our best to you all."

Here's a friendly and appreciative letter from *Dick Bailey*, who was the life of the party at our New York dinner: "What a very nice time all of us '15ers had in Fun City! You did such a nice job as class secretary to promote and officiate the reunion that I cannot think of the appropriate words to thank you and express my great appreciation. For days I had looked forward to seeing you, Piate Rooney and the rest of them and it was most delightful to have my dreams come true! I had a nice luncheon with Speed Williams a week ago today and saw three musicals, "Mame," "George M." and "Cabaret," also the Radio City Music Hall. But I did not go to New York City just to see them. My main object was to see you and the other fine members of M.I.T. 1915 who attended. I will look back on that evening for many days to come. And I hope to see you a year from now in New York City. My sincere thanks. This letter was written with the pen Pirate Rooney gave me last week."

It's sad to report the loss of a popular and active Classmate. *Doug Baker* passed away May 4. He had been sick a

long time and more recently had been desperately ill in the Rutland (Vermont) Hospital. The sincere sympathy of our Class goes to Elizabeth and her family.

Keep in mind our 55th Reunion, June 12-15, 1970 at Coonamessett Inn, Falmouth, Mass. Here endeth our column for this year, with friendly wishes for you all and your families to enjoy a healthy and happy summer with my profound thanks for all that you've done to "help Azel."—*Azel W. Mack*, Secretary, 100 Memorial Drive, Cambridge, Mass. 02142

16

The 53rd reunion at Chatham Bars Inn on Cape Cod is now just history. We know, as we write the column in advance, that the Inn provided those in attendance everything one could want at a 53rd reunion—wonderful meals, and old-fashioned clam-bake on the water's edge (unless weather prevented, with chances of about 1 in 10) with clams and lobsters in definitely New England style, sunshine salt breezes and all the comforts of our favorite Cottage G. If you missed the reunion this year, vow now you'll not miss the 54th next year. It was a real pleasure to share the Inn with the young-looking members and wives of M.I.T.'s 50th anniversary class of 1919. And incidentally, *Dick Berger* supplied copies of his latest bulletin on cancer prevention (mentioned in last month's column), which were made generally available to all ages of reunioners at the Inn. The fact that this was our 12th reunion at Chatham Bars Inn speaks pretty well for our favorite class-get-together spot on the Cape.

We are proud to announce that one of our '16ers is the author of a current new book, new in 1968, and bearing the title *Anson Marston: Iowa State University's First Dean of Engineering*. The author? Our own *Herbert J. Gilkey*, Professor of Engineering Mechanics, Iowa State University; and the publisher: the College of Engineering of the University at Ames, Iowa. We have been hearing bits about fact-gathering problems as the book has been in preparation, and we were pleased beyond words when we received a copy a little while ago—a copy that went on display at the reunion in June. As stated in the preface by the present Dean of Engineering, "Anson Marston, the first Dean of Engineering at Iowa State College (now Iowa State University) was a true leader in the engineering profession. . . . It is fortunate that at Iowa State, Dr. Herbert J. Gilkey, a former associate and close friend of Dean Marston (and himself an eminent engineer), has had the vision of preparing a permanent record of the life of the Dean in the form of this book." Herb calls it "light reading" and we find that in fact it really is. One thing we liked especially was an introductory section, on "About the Author, Herbert J. Gilkey" by Professor Edward H. Ohlsen, which included a fine picture of Herb himself. This gives us something we have always wanted; Herb has not been one to talk much about himself.



J. S. McDowell, '16 Dr. R. E. Gruber, '16

Here is what the introductory section says: "Herbert J. Gilkey was born in the state of Washington and received his early education in Oregon. His formal education includes bachelor of science degrees from Oregon State University, Massachusetts Institute of Technology, and Harvard University, and the master of science degree from the University of Illinois. He received the honorary degree, Sc.D., from Buena Vista College in Iowa. Professor Gilkey's experience, interrupted by two years of military service in World War I, is composed largely of educational and research engagements: two years in the department of Theoretical and Applied Mechanics at the University of Illinois; eight years at the University of Colorado where he advanced to the rank of Professor of Civil Engineering; twenty-four years as Professor and Head of the Department of Theoretical and Applied Mechanics (which he organized in 1931) at Iowa State University; five years as full-time professor following his retirement from the administrative post. During his years at Illinois, Colorado, and Iowa State, Professor Gilkey did extensive research work on the composition, production, and properties of portland cement concrete; his voluminous writings include numerous authoritative papers on this topic. He also was a concrete consultant on the Stevenson Creek, Gibson, Hoover, and Eleven-Mile Canyon dams. His colleagues in the profession affectionately refer to Professor Gilkey as Mr. Concrete. Society memberships: American Society of Civil Engineers, American Concrete Institute (Director, Vice President, President, recipient of Wason medal and Turner gold medal, honorary member), American Society for Testing and Materials (honorary member), American Society for Engineering Education (Council member, Chairman, Mechanics Division), Iowa Academy of Science, Tau Beta Pi, Phi Kappa Phi, Sigma Xi (president ISU chapter). Since 1960, Professor Gilkey has been on the staff of the Department of Engineering Mechanics at Iowa State University on a part-time basis. This manuscript, the result of a tremendous amount of painstaking research and meticulous assembling and recording of historical events in the life of the late Dean Marston, is one of the fruits of this period of his service to the University." Congratulations, Herb!

Our most distant correspondent this month is *Jack Camp* of Mexico City who is well known to most of us for his bits of philosophy and erudite commentary. This time he says he just came across the following in a company sheet: "Twenty years ago I was told I wasn't as smart as my father. Today I'm told I'm not as smart as my teen-age son. Where did my generation go wrong?" If you want to answer this publicly, just write to one of your class secretaries. If you want to tell it private-like write Jack direct at Apartado 1005, Mexico 1, D.F. He expresses his April sympathy for all the snow "you have had up there." Then, "You should have come down for our M.I.T. Fiesta. Professor Lionel S. Marks, who taught me thermodynamics at M.I.T., after becoming Professor Emeritus at Harvard came down every year about the first of January and returned about the first of April, as he said 'to get out of the weather and into a climate.' You might plan on trying it next year—usually the second Thursday to Saturday of March. Many who came this year, came several weeks ahead of time to escape the weather up there and see something of this country." We might add that some of us electricals (Course VI) had Professor Marks and remember how hard he tried to make us understand what entropy is, with a symbol of something like the integral of dH/T , but apparently represented by the integral of dQ/T in the handbooks of today.

From *Ed Hanford* of Hammond, Ind., we have a note of appreciation for the class notes "for they help me remember I'm an M.I.T. man." Then speaking of reunions, he says: "Some day I'm going to one of the reunions. Right now I have four business phones in three cities: Hammond, East Chicago and Gary so you can guess I don't have much spare time. Just to make sure I don't get in a rut I have a daughter who is a freshman at the University of Kansas. Getting her and her baggage in and out of O'Hare Airport this past winter in snow, fog and sleet has been pretty rugged. Right now I have a 10-year-old cat who persists in sitting on this note. Oh well, c'est la vie!" That final note about Ed's pussycat surely strikes a bell. This must be a pretty universal characteristic of all our feline friends.

Free Clarkson, in Bradenton Beach, Fla., in late April, said the fishing, the swimming and the sunning were too good to leave just then but he expected to be back in Newfane, Vt., by mid-May. He added: "Have seen *Will Wylde* who has bought a place in El Rancho Village, Bradenton and *Emery Kemp* who is an officer on the M.I.T. Club of Southwest Florida. Also Whit Brown, '15, is a winter resident of Anna Maria Island and one of our good friends."

John Gore of Canajoharie, N.Y., admits turning 75 in early April, presumes the class secretaries are in the same general area of agefulness, and says: "Funny, but I don't feel any older than I did 10 years ago—can do most anything. Of course, I take it easier and don't try to do too much—sleep late, rest, enjoy FM music and TV, etc. Also we like to go out riding and look for the birds. Saw 38 varieties today (April 4)—spring is really here. Best wishes—see you in June."

Charlie Glann in Oswego, N.Y., says there's not much to write about: "Due to poor health on both sides, can only say that we are like the old army 'Hurry up to wait.'"

Look alikes

Back in March, we mentioned that *J. Spotts McDowell* was the writer of the book *Modern Refractory Practices* (four editions) that has been widely used by colleges and universities as well as in industry. We recently received an unusual picture of him, taken by his friend, Brent Wilson, who was president of Harbison-Walker Refractories Co., (J.S.M.'s company) prior to its acquisition by Dresser Industries. Regarding the picture, taken in his retirement quarters at Webster Hall Hotel in Pittsburgh, Spotts says: "The crayon portrait on the wall was made by Mrs. Wilson from a snapshot. To say that I was surprised when the picture was presented to me is putting it mildly. I could hardly believe it. Warm regards."

George Crowell of Brockton writes on the letterhead of T. F. Crowell & Sons, General Building Contractors, that he is still active in this business in which he joined his father in 1919, after three years with Westinghouse, Church, Kerr Co., of New York City. He notes: "Mention of this

company brings to mind that eight Course II men and three Course IV men went there for short periods in 1916—Evans, Austin, Guething and Crosby are some that I can think of now.” Then: “My outside activities are somewhat limited since they were mostly connected with banking, and legislative bills have been passed regulating interlocking directorates and age limitations. Family notes—my wife, Martha, had the misfortune to break her hip this year but I am happy to say she is doing very well; we missed Ft. Lauderdale this year for the first time in many years. Our 50th anniversary in February passed rather quietly as Martha was in the hospital. No. 1 son, Bob (Norwich University), two teen-age children, has an insurance adjuster business in Boston. No. 2 son, Bruce (Dartmouth), associated with me in the building business, has three daughters: oldest, Dean’s list Pembroke; next entering Mary Hitchcock Nursing School in September; third daughter in high school. No. 3 son, Craig, died in April 1967.” George hoped to make the 53rd reunion but found it a bit doubtful at the time of writing in April.

Larry Knowlton of Cumberland, R.I., indicates that his activities are pretty well limited to home and family, which would be “of little interest to the few members of the class who might be able to identify” him by name. Larry and your secretary were classmates through grammar and high school in Lowell; he went to Harvard for his degree and was associated with us ‘16ers for a year at Tech. We recently ran across an old diary for the year of 1905 in which Larry was often mentioned. A number of the items in the diary paint a picture of the economics of the day in 1905, what boys of 12 were getting for the kinds of work they could easily do. Here are a few: shoveling snow from a neighbor’s sidewalk, 12¢; picking dandelions from a large lawn, 70¢ for 600 plants; picking blueberries in the fields and selling them to neighbors at a summer resort in Maine, 14¢ a quart; bicycle errands for a neighbor with no boys, 5¢ for two errands. How things have changed!

Here are a few changes of address: Eugene J. Barney, 31548 Robinhood Dr., Birmingham, Mich. 48010; Raymond G. Brown, Apt. 411, 151 Buffalo Ave., Niagara Falls, N. Y. 14303; Colonel William W. Drummey, 9 Hawthorne St., Boston 02114; D. K. Este Fisher, Jr., 3908 N. Charles St., Baltimore 21201; Ralph E. Forsyth, November 1 to June 1, 780 Pine Court, Naples, Fla. 33940, and, June 1 to November 1, Box 663, Pocasset, Mass., 02559; Paul D. Harrower, 215 Fort Pleasant Ave., Springfield, Mass. 01108; Mark Lemmon, 3211 Mockingham Lane, Dallas, Texas 75205; George M. Maverick, R.R. 1, Box 304, Charlottesville, Va. 22901; Allen D. Pettie, P. O. Box 1115, Tryon, N.C. 28782; James M. Ralston, Apt. 6-A, 777 West State St., Trenton, N.J. 08618; Frank D. Ross, 3400 Gulf Shore Blvd. North, Naples, Fla. 33940; Stephen G. Simpson, 15 Holman Rd., Auburndale, Mass. 02166

We continue to have monthly New York luncheons jointly with the class of 1917 at the Chemists’ Club, 52 East 41 St., on the Thursday following the first Monday of the month, from September through June. Those present at the May 8 luncheon included Art Caldwell, Joe Barker and Peb Stone, greatly outnumbered by seven genial ‘17ers plus Ed Aldrin’s guest Sivavong Changkasiri, ‘53. If you live in the New York area, set these Thursdays aside for some right pleasant get-togethers. If you are planning a trip to New York, try to make it coincide with one of these monthly dates.

And now we come to the end of the column for the current academic season. With other appreciative secretaries we are sorry to have Ruth King of the Review enter into retirement but are pleased to offer our best wishes for the perhaps-more-leisurely months ahead. We conclude by asking that you keep your secretaries busy and bouncy by writing a little but writing often, deluging us with all kinds of stuff, such as bits of philosophy, solid seasoned common sense, and even comments on the way things should be done both locally and in broader areas.—Harold F. Dodge, Secretary, 96 Briarcliff Road, Mountain Lakes, N.J. 07046; Leonard Stone, Assistant Secretary, 34-16 85th St., Jackson Heights, N.Y. 11372

17

On April 17, the M.I.T. community in New York was treated to something new and inspiring. The M.I.T. symphony entertained at Carnegie Hall. This certainly shows the changing times and apparently the Carpet Baggers of our time have disappeared. We missed seeing Mrs. Karl Compton but understand Rudy Gruber, ‘16, “sat in for her.” Attending were the Erbs, Loengards, and the Proctors.

P. Y. Hu, PO Box 333 Kuala Lumpur, Malaya, writes on his Christmas card, “Thank you and Stan for your kind attention to my grandson, Chi Kuan, especially to Stan who reacted very enthusiastically and sympathically to him during your absence. He went to see him, invited him to lunch, and introduced him to teachers and friends who will not only be helpful to him at present, but also in the future.”

Colonel Aldrin, Jr., Buzz, quoting from the *Record American* of Boston April 15: “The important thing to point out is that we are going to have lunar surface exploration by two men. Armstrong, Aldrin, and Collins will be launched July 16th on the ten day Apollo lunar flight, and Armstrong and Aldrin will detach in the lunar lander to make the actual landing. At Cape Kennedy, the Apollo craft was mounted on its Saturn 5 rocket yesterday in preparation for the flight. Armstrong and Aldrin will spend two hours and forty minutes walking around on the lunar surface after the initial landing, and 22 hours on the Moon all told.” According to Buzz’s father, our Ed Aldrin, Sr., it is a team job with Buzz piloting, which

guarantees the return voyage from the Moon. In retrospect it is interesting to note that on May 19 Clark University of Worcester, Mass., had a convocation to dedicate the R. H. Goddard Library. The speaker, Senator Edward M. Kennedy along with Colonel “Buzz” Aldrin were given honorary doctorates. This bridges the span from the rocket inventor, the manned space program started by President Kennedy, and the Apollo moon landing.

Don Severance, H.M., and Al Lunn were on the panel for Long Range Planning at the American Alumni Council meeting, April 28, in Washington, D. C.

Supplementing the June Review notes relative W. W. Rausch’s passing, Mrs. Rausch writes: “Thank you so much for your kind note of sympathy in behalf of 1917. The enclosed clipping may help in bringing your notice up to date. Please extend my kindest regards to the 324 members of the Class,” (now 322). The clipping is from the December 13th *Northampton Gazette*. “He died in Cooley Dickinson Hospital. Prior to his retirement in 1961, he had been an architect and construction engineer. Early in his career, he was in charge of the construction of the Old John Hancock Life Insurance building, and of the Old Federal Reserve Bank, both in Boston. At the age of 28, he was in charge of the construction of the original Northampton Veterans Hospital. In 1935 he was appointed New England’s director of Slum Clearance under Harold Ickes. He was a pioneer in the pre-cut type of housing, and engineered the construction of many low cost housing projects, including the original Almont Village in Arlington, and Anchorage Village, which was the Navy Housing Project in Newport, R.I. and many others. He became President of Anchorage Homes, Inc., in Westfield in 1946 and moved to Worthington in 1947. He became associated with the E. F. Carlson Construction Co., in Springfield in 1951, and continued in that Company until his retirement when he established his own consulting service. He was an early advocate of road resurfacing method of road re-surfacing which is now widely used.”

Tharratt G. Best, 201 Main Street, Boonville, N.Y. died on March 27. We are indebted to his daughter, Mrs. David P. Clarendon for sending John Holton the obituary notice which appeared in the *Utica Daily Press*. She writes: “I am writing on behalf of my mother Helen M. Best. I am sorry to tell you Dad left us. He had really been ill since last December and sustained two operations, one in January and the second on March 17th. After the latter date he never regained strength and the illness took him rapidly downhill. He was so interested in M.I.T. and all its activities.” Quoting from the *Utica Daily Press*: “Mr. Best served as president and chairman of the board of the 1st National Bank of Boonville for 44 years. The bank was founded by his great grandfather in 1866. He was elected a director in 1923 and became president

a year later. He served as president of the Oneida-Herkimer Bankers Association and chairman of the fair trade committee. He was born in Denver, Colo. and came east with his parents at an early age. Coming to Utica with his family at the age of 12 he was graduated from the Cecily Baker school; Utica Free Academy in 1910 where he took post graduate courses, and Princeton University in 1915. After a year of post graduate duties at M.I.T. he was a student engineer for General Electric. He enlisted with the American Field Ambulance Corps for service in France before U.S. entered World War I. He served under fire and was gassed. While convalescing in an evacuation hospital it was hit by German planes. He later served with the American Motor Transport Corps. During his time in France, his letters home were published in a column entitled 'Somewhere in France' in the *Utica Daily Press*. Promoted in 1922 to a Captain in the Army Reserve Corps, in 1931 to the rank of Major and in 1937 to Lt. Colonel. He was called up for service in 1941, two months before Pearl Harbor. At Fort Hamilton, Brooklyn he commanded the original Port Battalion which evolved into the Transportation Corps Unit Training Center, with 12,000 men. The Land-Ship method of training, which Col. Best pioneered became standard in the army. He was commanding officer at Fort Slocum when the War ended. He was vice commander of Central New York Chapter of the Military Order of World Wars, and served as president of Central New York Chapter of the Reserve Officers Association, and executive committee member of the state's Fifth Judicial District, R.O.A. He was a 46 year member of the Reserves Officers Association. For two years after the war he was a civil and petroleum engineer with an Oklahoma concern. He returned to the Utica area in 1921 and became assistant city engineer. After he became president of the Boonville Bank he served as village engineer and consultant. He laid out seven developments there and completed more than 650 other surveys and engineering projects, among them, nearly all of the re-forestation tracts of Oneida County. He served as trustee and acting mayor of Boonville and for 12 years as chairman of the Municipal Commission for Light, Power and Village. A student of history, Col. Best was a speaker at the Secquicentennial Pilgrimage at the Oriskany Monument. He was historian for the Oneida County Committee of the American Legion, and author of 'Pageant of Boonville,' a supplementary reader used then by Boonville grade school children. He was a member of the Oneida Historical Society and Herkimer County Historical Society. He had served as commander of the Charles J. Love Post of American Legion, and was affiliated with the Mohawk Valley Consistory and Boonville Lodge, F & A M, having served as past master and treasurer. He was also a member of Ziyara Shrine Northern Lights Shrine Club. He was a member Sadaquada Golf Club, Fort Schuyler Club, Princeton Club of New York, Air Force Association of Griffiss Air Force Base, Erwin Library and Institute

Board, and Mohawk Valley Society of Professional Land Surveyors. He was a senior warden for 25 years of the Episcopal Church. An extensive traveller, he had visited Europe, Orient, Holy Lands, South and Central America, Africa, and every state except Alaska. He also had visited every Canadian Province, Scandinavia and the Caribbean. He was as fluent in French as in English, having kept a French diary from the age of 15. He also spoke Spanish, Italian, German and a smattering of Polish, modern Greek and Norwegian. Col. Best initiated the naming of the aircraft carrier U.S.S. Oriskany. He was writing a history of Oneida County at the time of his death. Besides his wife he leaves two daughters, Mrs. David P. Clarendon, Miami, Florida, and Mrs. Ernest Stemler, Boonville, N.Y."

John Holton deserves honorable mention for his canvassing the '17ers in western New York state. He received a letter on March 4 from Colonel Best, just three weeks prior to his demise, and we quote from same. "In response to your letter of recent date, I doubt if I should attempt to tell you about my life, as it would sound too much like an obituary notice. I have already witnessed that when I was the central figure over a year ago in a local rendition of 'This is your Life.' The memory of our 50th reunion is one which stands out as a shining star in my existence. We of 1917 were lionized, feted and honored to the n'th degree. Our loyal spouses too appeared to revel in the great occasion. Following a very active career, a three-pronged affair, I am now semi-retired, but the days are barely long enough for my varied activities. I still serve on my bank advisory committee, still do some surveying and engineering consultation work and am busy writing, especially upon local historical topics. I manage four estates and two trusts, my reforestation tracts demand much of my time in the milder season. I even play atrocious golf occasionally with a few contemporaries, and my better half and I travel extensively, having visited all of the continents with plans for more travel."

Nobel laureate

It seems there is a carry over of news of our distinguished *Robert S. Mulliken* from last year so quoting from the University of Chicago notice of last August: "1966 Nobel laureate in Chemistry and Distinguished Service Professor of Physics and Chemistry at the University of Chicago has been elected a corresponding member of the Societe Royale des Sciences de Liege, Belgium. The Societe was founded in 1835, 'for the advancement of mathematical, physical, chemical, mineral and biological sciences.' In 1968 its membership numbered 169. Only a few new members are elected each year. Mulliken is an honorary member of the Societe de Chimie Physique (Paris), an honorary fellow of the Chemical Society (London), a foreign member of the Royal Society (London) and a member of the National Academy of Sciences, the American Philosophical Society, and the American Academy of Arts and Sciences. He

has received five major awards from the American Chemical Society: the Theodore William Richards medal given by the Northeastern section of A.C.S. (1960); the Gilbert Newton Lewis Award given by the California section (1960); the Peter Debye Award also given by the California Section (1963); the John Gamble Kirkwood Award given by the New Haven section and the Department of Chemistry at Yale University (1964); and the Willard Gibbs Medal given by the Chicago section (1965); also the Gold Medal Award for Scientific Achievement from the City College (New York) Alumni Association." Quoting further from the *Springfield News*: "Dr. Robert S. Mulliken will give the first Lucy Pickett lecture at Mount Holyoke College, South Hadley, Mass. in Cleveland Hall. Mulliken, the Ernest D. Burton distinguished service professor of physics and chemistry at the University of Chicago will discuss, 'The structure and spectra of ethylene and its simple derivatives.' The lecture will honor Professor Emeritus Lucy Pickett, who retired last June from the Mount Holyoke Chemistry Department, having served on the faculty for 38 years."

Attendance at the New York monthly luncheons at the Chemists' Club is on the grow: in April there were 10 in attendance with Bill Hunter and Francis Stearns of '16 down from Hartford. At the May luncheon there were also 10 in attendance with *Ray Brooks* in absentia, but in contact by telephone. Possibly the small stag party at Ray's home in beautiful Summit the night before had something to do with his absence; *Al Lunn*, *Ed Aldrin*, *Sr.*, and *Dix Proctor* made up the foursome. We were honored by the presence of Al Lunn down from Boston via Pennsylvania and Sivavong Changkasri, '58, of 23 Vorapong Lane, Bangkok, Thailand, a guest of Ed Aldrin who advised, "A month ago I met an M.I.T. '58 Thai (Siamese), and I invited him to join us at this luncheon. Eddy (for short, as known by his classmates) attended a dinner party at the local golf club after flying in from Boston. He and I had a nearly parallel start—he spent a year at Worcester Polytechnical Institute and then took a masters in Course II (there just were 40 years between). Then I showed him my Siamese pilot's wings and he was sure his uncle, who was Chief of the Air Service or Force, gave them. I hope to bring a picture taken in Bangkok in 1924, General Mitchell, me and the Chief. (What happened to the picture Ed?) Glad to know Al Lunn plans to join us. I just talked to Buzz and he sends his best." Eddy is spending six months in the U.S. on the Eisenhower Exchange Fellowship. Already *Bob Erb* has been asked to address the M.I.T. Club when he goes to Bangkok come October, and there may be other M.I.T. visits on route.

Ray Brooks rates a paragraph in the April Newsletter of the M.I.T. Club of Northern New Jersey, "You never know what bit of history you will learn at an M.I.T. meeting. It turns out that Ray Brooks should be an honorary member of the liberal movement. He and a couple of other M.I.T.

graduates were probably the first to find themselves in a Wellesley dorm after hours. He recalls an impression of meeting undergrad Mayling Soong that night—she was later to become Mme. Chiang Kai-Shek." So Ray you missed the 9:49 and slept in the trolley at Natick and had that early morning walk up from Scollay Square. I am pleased to report that Ray looks very well.

Our October 8-9 interim reunion will be held at Northfield Inn, Northfield, Mass. Details forthcoming from Dud Bell.—*C. Dix Proctor*, Secretary, P.O. Box 336, Lincoln Park, N.J. 07035; *Stanley C. Dunning*, Assistant Secretary, 6 Jason St., Arlington, Mass. 02174

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You are all aware of the campus unrest all over the United States. I am sure you are all following developments in this area at M.I.T. through letters from President Howard Johnson and reports in this and other issues of the *Technology Review*. As your local representative, I think it in order to give you my impressions, as an alumnus, of what is going on here, especially since I participated in a small way in the current dialogue between the students and the Establishment.

I agree with Professor Zacharias that there is no generation gap. Both young and old have frustrations about Vietnam, urban problems, nuclear bombs, and what not. The older group—you and I—are adjusted to accept an imperfect world and carry on, meeting world problems, though baffled, just like we endure arthritic aches and pains, and high blood pressure even while we are trying to be cured of them. The college youths, however, are impatient and insist on immediate solutions to social problems, even though we still do not know the cure for these cancers, as indeed we are still groping for the cause of cancer in the human body.

At my particular confrontation with the students, I found them polite, bright, and articulate. I was not converted to their idealistic point of view nor they to my practical down-to-earth ideas of every day life. As the evening progressed, however, we each began to understand that there might be another way of looking at life than one's own philosophy. When you talk openly, no holds barred—for two hours or more, this sort of give and take decreases the mental belligerence and the resultant scene is a bit more peaceful.

The M.I.T. dialogue between students, faculty, staff, and alumni is continuing. It gives everyone a feeling of being in on decision-making, the small dissident minority gets a chance to let off steam, with all parties present the decisions must be that of the majority and the overdue improvements in the University structure become evolutionary instead of revolutionary. I am proud that M.I.T. in

its traditional manner has taken a bold step forward, using innovative ideas to solve its campus problems.

What about you and me, alumni of fifty years standing? Many of us cannot understand the younger generation or the administration who must struggle patiently to cope with them. And so we become angry and impatient. May I counsel patience and understanding. I have experienced the dialogue. There is great need—a desperate one for continued dialogue—for you to listen to the students, for the students to listen to the staff and the Alumni. Let's do our part individually to be in the dialogue—if you cannot be here in person—write to the *Technology Review* or *The Tech* or to me. I will do all I can to see that it gets through to the students.

And now for personal items. The first is *George Ekwall's* interesting story of his conversion from chemist to minister; the chemical formulae for such a reaction is described in detail.

"This brief autobiography, written at your request, tells about the most provincial member of the Class, for I was born in Waltham, Mass., on February 26, 1897 and still live there. Waltham is the place because of my family's association with the old Waltham Watch Company, and because in those days people lived near enough to their work either to walk or ride the trolley cars. Some of you knew me at Tech between 1914 and 1918 but as I commuted I did not engage in many student activities. During our senior year there was a shortage of men for the instructing staff because of the war, so I served in the quantitative analysis lab as an assistant to Professor William T. Hall and continued for the required summer course in qualitative analysis. Professor Hall said that some of the Department wanted to give me a section in that course but it was decided not to do so because I was only twenty-one years old. Nowadays some young men of that age feel qualified to run universities!

"As summer school progressed I was asked to go to the Students Army Training Corps officer's training school at Plattsburg Barracks, N.Y., as a representative of the instructing staff, and then return in the fall to continue as assistant (at a salary of \$500) and also have some vague kind of military duty. Most of the men there had just completed their freshman year in college. A few of us had been teachers or professors. When the course was over we were told we could not go home. We should have to stay there indefinitely and were offered commissions as second lieutenants. As days passed it seemed wise to accept the commission rather than an indefinite future and I did so. This meant that Professor Talbot would have to find another assistant for the lab, but those were days of confusion.

"The decision turned out to be wise, because it probably saved my life. As one of six hundred second lieutenants I re-

ported to Camp Grant, Ill., to be assigned to troops training for overseas. But the flu epidemic flourished and the troops did not appear. So the 'baby' lieutenants went to school for further study. But I had left Boston with the flu, spent the first evening at Camp looking over a list of officer candidates—with a splitting headache—and the next day went to the Base Hospital with flu and pneumonia and stayed there for seven weeks, carried AWOL because nobody knew where I was. There were no antibiotics then but they had an experimental serum which they gave to officers. It worked. We lost 1,200 men but only two officers. Without that treatment my story would likely have ended in September 1918.

"After the war I joined the chemical staff of the Hood Rubber Company in Watertown (next to Waltham) and was a chemical engineer there for seven years, working on cord tires, which were beginning to replace the old fabric tires, first as high-pressure tires and then as 'balloon' tires, as the first low-pressure tires were called; 10,000 miles was good mileage for a tire then! I also worked on solid rubber truck tires, which presented quite a problem in compounding and vulcanizing. The problem was to get sufficient heat into a solid chunk of rubber to vulcanize the center without overcuring the outside. (Accelerators were just coming into use.) The outside would chip if too hard, or the inside could get spongy and blow out under overload.

"The work was interesting but I was becoming more and more interested in the work of the Christian ministry. Many factors were leading to a decision to make a change when one day my boss said, 'All I care about in the world is to make a good tire compound.' That was enough, and I made my decision to enter the Episcopal Theological School in Cambridge. There was a lot of reading to do there but since I got my degree with distinction in 1929 we may conclude that a Tech education is good preparation for theological study. During my three years in the seminary I served as assistant to the rector of my home parish, Christ Church, Waltham, for two years as a layman and then as an ordained minister. In 1930 I became the rector and continued until the Bishop asked me to be an archdeacon in 1960. I served as one of three for awhile and then as the Archdeacon of Massachusetts until my enforced retirement at age 72 last February. Now I fill in wherever I may be useful and am busier than ever.

"My wife Ruth, a musician, my organist and choirmaster, when I married and fired her in 1936, turned from music to the hobbies of painting and designing and making stained glass medallions. She also raised a son and a daughter who have given us three grandchildren with another just about due."

Continuing the saga of what has happened in half a century, here is *Charlie Watt's* story. He was born and raised in



W. C. Foster, '18

Perk Bugbee, '20

Lexington, Mass. He showed his leadership qualities early at Lexington High School as a three-letter man in athletics. In our junior year at M.I.T., he was vice president of our Class. He won his letter at Tech in football—now his activity is confined to bridge and golf. As with all of us, World War I cut into the last months of our senior year and he came out of it a Lieutenant in the Field Artillery. Charlie then went to work for the American Zinc, Lead, and Smelting Company at Mascot, Tenn., starting as Mucker, then Powderman, Shift Boss, and Chief Engineer. He spent a some time in Alaska examining mine properties in the winter and returned to Tennessee for the summer. Then on to Neihart, Mont., in August 1923, to open up a new property—and here ended the business of following the mining profession. In October, he and his wife (a childhood sweetheart) found themselves at an elevation of 7,200 feet with no place to live but a tent. By February the temperature there had dropped to 40° Fahrenheit below zero and adding insult to injury, mountain sickness (worse than the sea variety) reared its ugly face and it was back to Boston with no job.

Fortunately soon thereafter the Boston *Transcript* had an advertisement for a steel salesman. Charlie answered, was accepted, and by 1936 became New England District Manager for the Truscon Steel Division, Republic Steel Corporation. His business and community interests are many and varied, among them he is a past president of the Boston Chapter of the Producer's Council, Inc., and a past president of the Massachusetts Building Congress. He is a Director and Chairman of the Property Committee of the Francis Willard Home.

Since retirement, Charlie has been working with young men helping them to get a start in business and to continue successfully. Golf and bridge are still his hobbies—and Charlie and his Mildred can be seen several times weekly at the Oakley Country Club located "in his front yard" in Watertown, Mass. In the winter, Pinehurst receives their attention.

I am indebted to *Mal Baber* for a synopsis of his goings on. "Thanks for your nice letter. I regret that my own life

and current pursuits offer so limited a field for class notes of interest. As you presumably know, I am a practicing C.P.A. in a minute firm. Age and coronary condition tend to limit my activity, but are more than offset by the successes of Congress in passing more and more complicated laws and the surpassing ingenuity of the Internal Revenue Service in implementing them by ever more numerous, complicated and I might almost say—incomprehensible forms. Also, I might add—they are closely pursued by a whole pack of state and local governments.

"Although not currently traveling far and wide I have had the unusual advantage of traveling in depth, having made my first to Europe in 1905. The old *Camparnia*, a coal burning—natural draft steamer of late 19th century vintage, and of course with no radio. I am thus in the position to note progress towards one world—Coca Cola, Chewing Gum Machine and, in reverse,odka.

"Having served in two wars, I am now retired as a Commander U.S.N.R. and take a fairly active role in a local military Order of the World Wars (they have conventions of great interest). Some of my papers I have sent to our Francis Hart Natural Museum. Those which deal with the U.S.S. *New Jersey* have suddenly developed a timely interest. We do of course get away from time to time and have a small place on Hilton Head Island. However, it is basically a quiet and uneventful round especially as compared to the various addresses and hegiras which fill the Alumni notes of the 50 plus classes and not M.I.T. only. However, few have as hard working and capable a secretary as M.I.T. 1918. So thanks to you and to your wife from one of the chorus."

Considered for Nobel Peace Prize

Through the courtesy of Granny Smith and Julie Howe, I am happy to report to you that on April 3 last, *Bill Foster* was honored by a group of his friends at a dinner held at the Statler Hilton Hotel in Washington, D.C. It was "A testimonial from his friends in appreciation for a lifetime of devoted and selfless service to his Country, and to the cause of world progress and peace." It was pre-

sided over by Paul G. Hoffman, while the speakers included John J. McCloy, Dean Rusk, Hubert H. Humphrey, and Gerard Smith. The committee and guests included national and international leaders in quest for world peace. A scholarship in Bill's name has been established at the Johns Hopkins School of Advanced International Studies with the award being given to an outstanding student. Granny Smith sent a telegram of congratulations on behalf of the Class. A news note in a recent issue of the *Christian Science Monitor* indicates that Bill is being considered for the Nobel Peace Prize. Those of us who have been following Bill's career, as I have, say he richly deserves this honor. In the meantime, now that Bill is retired—we hope he gets in some time for his hobby—sailing.

Granny Smith is responsible for an interesting report of the sixth annual spring picnic of the M.I.T. Club of South West Florida held Sunday April 20, at Bill Grunwell's "Airy and Shady Acres" between the Gulf and Bay at Englewood Florida. He made the trip by boat through the island waterway from Sarasota. Sixty-eight alumni and families had a ball. Granny leaves July 11 for Amsterdam visiting Holland, Germany, and Portugal for five weeks, then back to their cottage at Lake Androscoggin, Wayne, Maine where any wandering '18er can find him and Dottie by asking the local post office or grocery. On your trip back to Florida, Granny, stop by and see us at 87 Ivy Street, Brookline, Mass.; we will have much to talk over.

A news note recently in the Boston *Herald Traveler* recorded an "Architects Art group show at the Boston Architectural Center," 320 Newbury Street, Boston with contributions among others from *Sam Chamberlain*. . . . The American Chemical Society recently honored its 50-year members, among them our own *Harold Weber*, emeritus professor of chemical engineering at M.I.T. . . . A note from *Harry M. Blank* indicates he retired from his family business in 1954, enjoyed that status for six months, but for the past 14 years has been working for the United Community Fund in Newark. What is this note from *Tech-nique* 1918? ". . . Jule and Harry occupy-

ing the back seats at Polycon lecture—considering the time they give to the Copley Plaza and the Delt teas respectively, they have to sleep somewhere." I am glad to note you and your good wife are enjoying good health; keep it up and send me more news.

J. Sidney Marine, of Scarsdale, N.Y., died May 13. He was with the Equitable Life Assurance Society of the United States before devoting his full time to tutoring in 1940. He had instructed several thousand local students from elementary school through college. Surviving are his widow, Helen, a son, James, his sister and four granddaughters.

The enclosed notice of the passing of *J. Sidney Marine* came to me through the courtesy of *Sax Fletcher* and *Herb Larner*. I am also most grateful to Herb for the most complete and searching report, "Ins" and "Outs" at *M.I.T.*, printed in the magazine section of the *New York Times*, May 18, 1969. I hope many of you read it. If not, try to get a copy; it is most worthwhile. Mildred and Herb will be in the Bavarian Alps when you read these notes; we expect a report on this trip to the Salzburg countryside in these columns shortly thereafter. Have fun, you two.

My scouts, in this case, *Herb Larner*, *Len Levine*, and *Sax Fletcher*, all sent me copies of the death notice of *Phil Dinkins* as printed in the *New York Times*, April 25, from which the following information has been drawn. "*Philip M. Dinkins*, of Palm Beach, Fla., died on April 25. Long active in the chemical industry, he was president of the *Jefferson Chemical Co., Inc.*, from 1946 to 1955 and before that vice president and general manager of *American Cyanamid*. Surviving are his widow, *Ella*, two daughters, and five grandchildren."

We note that *Chester C. Beach* of Rochester, N.Y. died in November, 1968.

Howard R. Wade, 136 Highland Avenue, Somerville, Mass., reports he is still breathing—good news—so are we all; keep up the fine work. . . . New addresses: *Stuart M. Boyd*, 2555 P.G.A. Blvd., Palm Beach, Fla. 33403; *Joseph A. Kelley*, Old Stuart Rd., Peterborough N.H. 03458; *Theodore A. Pierson, Jr.*, 1234 Old Nassau Rd., Princeton, N.J. 08540. I hope you all have a very happy summer and are busy vacationing and traveling. Please send me news of what you are now doing for inclusion in the October/November issue. Please note my correct address.—*Max Seltzer*, Secretary, 87 Ivy Rd., Brookline, Mass. 02146

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Edmund C. Adams regrets that he will be unable to attend our reunion but extends his wish for a rewarding and happy time to all those members of the Class who may attend. . . . *Rodolfo Fonseca*

sends best greetings to the Class, although he will be unable to join us. . . . *Ernest Voss* regrets and sends greetings to all the Class.

Aubrey Ames, San Francisco, sends best wishes. He has spent a long career in foreign trade, and has lived out of the country for 28 years. . . . *Maurice Goodridge* regretfully declines. He has been battling ill health this last year, and expects to have surgery for arthritis of both hips. Says, at least he gets out of snow shovelling. . . . *Robert B. MacMullin*, R. B. MacMullin Associates, Niagara Falls, N.Y., has just completed 50 years of membership in the American Chemical Society. . . . *Frank Fremont-Smith* has been the director of the interdisciplinary communications program at the New York Academy of Sciences since April, 1964.

Carl Phelps and his wife live in Tucson, Ariz. They will be unable to attend the reunion but send best wishes. Carl's career was enlisted entirely in education—37 years in Ceylon and South India. From 1932 to 1958, he served as principal of an elementary-secondary school in Kodaikanal, South India.—*Eugene R. Smoley*, Secretary, 30 School Lane, Scarsdale, N.Y. 10583

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A warm and welcome letter from *Dorothea Brownell Rathbone* says that she has been anchored in Providence, 24 Kingston Ave., to look after two granddaughters who are going to preparatory school there and will be attending two graduations, one at Wellesley and one at Wheeler School in Providence. *Dorothea* has qualms about being the only gal in the class for probable attendance at the 50th but she should know that a class reunion without her would be a real calamity and, as she says "Thank goodness for the wives!"

Dorothea thoughtfully sends news of *Norrie Abbott* who was recently presented the Award of Merit at the League of Rhode Island Historical Societies. *Norrie* was the League's first president, and, says *Dorothea*, has done a fine job of getting this organization well on its way. At the award meeting *Norrie* gave an address on "The Changing Face of Rhode Island Industry." *Norrie* and *Betty* have been absorbing more ancient history and art in Italy during April and May. We hope to see them and hear an account of their travels at Alumni Homecoming.

N.P.A.F. testimonial

At the annual meeting of the National Fire Protection Association in New York on May 15, a testimonial luncheon was tendered *Perk Bugbee* on the occasion of his retirement after forty-eight years of devoted service to the Association. A capacity audience of close to a thousand listened to foremost authorities on fire prevention including visitors from England and Australia outline the many

achievements and contributions to world wide activities in this important field and a standing ovation was given *Perk* at the conclusion of the ceremonies. Previously he and *Mina* had gone to Sweden where he was presented a gold medal for distinguished service to international fire prevention by the King, the first ever presented to an American. Among other honors was a special achievement award presented in Chicago by the National Board of Fire Underwriters. *Perk's* services to his chosen field will not end with his retirement as he has been appointed Honorary Chief Administrator by the N.F.P.A. for life and was persuaded to remain as president of the International Association of Fire Prevention which covers some sixteen major countries throughout the world.

Pete Lavedan, as one might well expect, continues to demonstrate how fortunate the community of West Harwich, Cape Cod, has been that *Pete* selected this area for retirement. *Pete* is presently immersed in active development of Harwich's 275th Anniversary program which will be celebrated throughout the summer season. As chairman of a committee of leading townsmen and women, *Pete* is guiding spirit of a diversified program worthy of the granting of a Charter of the town by *William and Mary*, King and Queen of England 275 years ago.

How to create a stir

As one of the founders of the Shakespeare Study and Reflection Society of Harwich, *Pete* created quite a stir on the Cape during one of the blizzards that visited the area last winter.

It seems that a meeting of this distinguished and highly selective Society was scheduled for the *Lavedan* home. Realizing the hardships that might be encountered by those who would brave the storm to attend the meeting, *Pete* resourcefully phoned the radio station and requested announcement over the air of cancellation of the meeting. The members were not only thus notified but shortly thereafter *Peter* was deluged with requests for information about this interesting society and requests for membership. This created somewhat of a problem since the purpose of the society, consisting of six retired gentlemen, were neither study nor reflection of anything other than straights, full houses and flushes, in short a poker club meeting weekly at the various members homes. The problem was solved without discourtesy to the many expressing interest in Shakespeare by concocting a *Lavedan* inspired questionnaire designed to discourage rather than entice applicants. Questions such as "How old are you?" and "Physical description" were calculated to dissuade female correspondents, but the snapper that seemed to put an end to further embarrassing correspondence was the final question which read, "Please identify the following quotation: 'Zounds, 'tis a royal flush.'" Meanwhile the SS&RS has a waiting list of some twenty-five but the Society wisely limits its membership to only six.



1921 was well represented at the 1969 Fiesta of the M.I.T. Club of Mexico City. In this picture, made at the University Club in Mexico, D.F., are (left to right) John B. Mattson, Elma Mattson, Wallace T. Adams, Anne Adams, Robert F. Miller, Helen Miller, Maxine Clarke, Carole A. Clarke, and Sumner Hayward.

Al Burke has been kind enough to loan me some correspondence he has been having with Carleton Alexander of Wickliffe, Ohio, generated as a result of my brief reference to Carleton as a radio ham in the March notes. Al, veteran Ham that he is, wrote Carleton about his early experiences in the field. He started in 1911 with a single telegraph line using the Morse code which he later polished by service with Postal Telegraph and the Boston and Albany Railroad. He used to operate a station on the roof of Filene's store in Boston with all message traffic coming and going by Western Union land line.

Carleton responded that he, too, started about 1912 with a single wire telegraph across the town of St. Albans, Vt. He recalls that he had a little two stage outfit on the Kobuk River in northern Alaska that kept him busy keeping in touch with bush pilots flying gold prospectors all over the territory and with planes ferrying gasoline from Fairbanks to Barrow on their way over the pole to Spitzbergen. At the same time the Beaufort Sea, lighter than air craft were sailing from Europe to Alaska and the Wien brothers were flying to North Cape, Siberia, to salvage fur from an icebound ship in the Arctic Ocean. Since none of these carried radio equipment, Carleton's station could give a lot of information about weather conditions, there being no weather station in his area, as well as the condition of emergency landing areas such as whether the ice on the lakes was rough or smooth and what sandbars in the summer were free of driftwood.

To provide the power for this primitive station, Carleton used an airplane type motor generator of 12 volts, driven by storage batteries with the generator putting out 500 volts. The batteries were recharged by a Pyle steam turbine from a steam drilling rig and sometimes by a windmill. Carleton says that due to his retirement from the heavy construction industry, which kept him from pursuing this interesting hobby, that he has now had an opportunity to revive his interest. However, he cheerfully gives credit to Al as the peer of all Hams in the Class, giving due acknowledgment to Al's valuable and long time contributions to Civil Defense communications.

In a list of corporate changes of M.I.T. alumni one notes that *Robert D. Patterson* is the representative on the board of Curtis Publishing Co., as trustee representing the Cyrus Curtis estate.

Herb Fales now resides at 2201 North Central Ave., Phoenix, Arizona. *Fred Hopkinson* is in Rochester, N.Y. address 20 San Rafael Ave. *Charles Lawson* is in New London, New Hampshire, address Slope and Shore Club.

At a recent meeting of the Boston M.I.T. Club your secretary was happy to encounter *Henry Hills* and is glad to report that Henry appears to be in excellent health and spirits. . . . Have a happy and healthful summer. Find time to write your secretary a bit of news so that it may be passed along to your classmates next fall when the *Review* starts its fiscal year.—*Harold Bugbee*, Secretary, 21 Everell Road, Winchester, Mass. 01890

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It is our greatest pleasure and reward for these writing efforts to receive news of classmates; particularly so when that news concerns honors bestowed upon them. Leading the parade this month is our faithful Assistant Class Secretary, *Edwin T. Steffian*, who has been elected to the College of Fellows of the American Institute of Architects. He was formally invested in special ceremonies at the A.I.A. Chicago convention in June. The honor is given for outstanding contributions to the advancement of the profession of architecture and is the highest A.I.A. award. Ted joins that elite group constituting less than four percent of the membership which, however includes three members of the Class of '21 from our famous group of West Coast architects—*Walter E. Church*, Portland, Ore., *Samuel E. Lunden*, Los Angeles, Calif., and *Glenn Stanton*, Portland, Ore. Ted has held A.I.A. membership for 33 years, serving as director, treasurer and president of the local chapter, the Boston Society of Architects, and has been a member of an advisory committee of Boston architects in aiding the city's urban development program. Ted has been chairman of both the New England

Judiciary Committee and the Contract Committee of the Commonwealth of Massachusetts. He is an active member of the American Arbitration Association, the Massachusetts Designers' Selection Board and the Children's Medical Center of Boston.

He and Lovina live at 46 Lakeview Ave., Cambridge 02138, where Ted has helped his home community as an instructor, the treasurer, president and now a director of the nonprofit Cambridge Center for Adult Education. He is a member of the Cambridge Advisory Committee together with other professional, business, civic and educational leaders appointed by the mayor to assist in traffic, transportation and zoning problems. He is chairman of its Harvard Square committee and a member of the Cambridge Civic Association. Ted has been co-chairman of the United Fund in Cambridge and chairman of the Greater Boston group for the construction industry. He is president of the architectural and planning firm of Steffian, Steffian and Bradley, Inc., 19 Temple Pl., Boston 02111, specializing in educational, institutional, housing and residential structures. His major projects include the Law and Education building and the Pappas Law Library, both at Boston University, and the Lasell Junior College dormitories, classroom building and central library. Ted has won design award citations from the *Progressive Architecture* journal and from the Boston Arts Festival. His memberships include the St. Botolph Club. Both of Ted's sons are architects. John is Assistant Professor of Architecture at M.I.T., teaching urban design, and Peter is a member of Ted's architectural firm. Congratulations, Ted!

If there were a "fellow" grade in the Class of '21, it would certainly include *Edmund G. Farrand*, 5981 La Jolla Mesa Dr., La Jolla, Calif. 92037, for his long years of service to the Institute, the M.I.T. Educational Council, the Alumni Association, and as a club and class officer. Ed was named one of the first Honorary Secretaries of M.I.T. in 1933 and was chairman of the Chicago group until 1950, when he moved to Georgia and assumed the same duties there. Now in California, he carries on the additional

Can you find them? Eighteen members of the Classes of 1920 through 1925 are shown in this picture of those attending the annual spring picnic of the M.I.T. Club of Southwest Florida. The scene is "Airy-and-Shady-Acres," the home of William R. Grunwell, '28, at Englewood, Fla. You are looking for Joseph H. Flather, '22, Bernard E. Groenewold, '25, Clyde K. Hall, '20, A. Raymond Holden, '23 (New President of the Club), Lowell L. Holmes, '23, David B. Joy, '23, Godfrey G. Keaful, '24, George G. Marvin, '22, Philip R. Payson, '21, Albert P. Powell, '22, Robert E. Robillard, '20, George A. Shattuck, '22, John W. Sibert, Jr., '25, Albert E. Smith, '21, George H. Smith, '24, Lancy Snow, '20, Richard J. Spitz, '21 and Jack B. Starkweather, '21.



duties of the Educational Council in La Jolla. From 1934 to 1941, he was Secretary of the M.I.T. Club of Chicago and, concurrently, from 1935 to 1938, its Acting President. He was elected President for the 1943-44 season. By 1951, the duties of the Class Agent for the Class of '21 had expanded to require a full-time officer and Ed took over the activities then being carried on by another class officer. In 1964, Ed became the first Class Estate Secretary appointed by M.I.T. In 1965, he was invited by the Alumni Association to become a member of the Committee on Class and Course Organization of the Alumni Long Range Planning Committee. He contributed extensively to the excellent report covering its year-long survey.

Despite his distant residence, he and Helen have been faithful attenders at our class reunions, Homecoming Day, Alumni Officers' Conferences and the Alumni Seminars. His frequent contributions to these columns are especially appreciated. Recent eye difficulty and severe sciatica have restricted his travel and required long periods in bed but have not curtailed his work for the Class and M.I.T. as evidence by phone calls from him reporting that he is slowly regaining strength but, nevertheless, carrying out the various projects for which he accepted responsibility. That this has been done effectively is attested by results to this early date of the Amity Fund, for which Ed shares the burden with Class Agent *Ed Dubé* and Chairman *Irv Jakobson* of the Class 50-Year Gift Committee.

Ed tells us that, at the moment, the Class of '21 holds fifth place out of the 92 class and course units reporting, in a close race that has see-sawed for top honors in the total amount contributed to this year's Amity Fund. This is the more amazing in that our Class is one of the smaller groups and is exceeded in size by all the current leaders. Ed disclaims credit and says it should go to you, dear reader, and to the other members of the Class for their generous, considerate and continuing annual support of a most worthy cause. Ed retired from his professional career as general manager, secretary and part owner of United Conveyor Corp., Chicago, to undertake an

active outdoor life farming the 4,000-acre Farrand Farms, Plantation, Leesburg, Ga., and in indulging his hobbies of music, photography and the love of horses. He was a member of the Southwest Georgia Planning and Development Commission and treasurer of the Leesburg Industrial Development Corp., until health dictated the move to La Jolla. His memberships include the University Club of Chicago and the M.I.T. Club of San Diego. Helen and Ed have a son, David, a graduate of New Mexico Military Institute and San Diego State College. We salute an outstanding "good fellow" among M.I.T. alumni!

Ski Hall of Fame

A posthumous award to Mrs. Alice Damosch Kiaer, the late wife of *Herman S. Kiaer*, was recently announced by the president of the U.S. Ski Association. She was accorded, along with similar posthumous honors to four men, induction into the National Ski Hall of Fame in Denver, Colo. In making the announcement, President Earl D. Walters of the association said: "These five Americans contributed greatly to the quality and growth of skiing in North America and they should rightly be remembered as pioneer builders of the sport in this country." Mrs. Kiaer, daughter of the famed musician and symphony orchestra conductor, the late Walter Damosch, was specially cited for having assembled the first U.S. women's ski teams for the 1935 International Ski Federation championships and also for the 1936 Olympic Games. Herman is president of Fearnley and Eger, New York shipping agency, and makes his home at 170 East 71st St., New York, N. Y. 10021

Munroe C. Hawes, 320 Boston Blvd., Sea Girt, N.J. 08750, came in for some reflected glory during the three-day celebration in Brielle, Manasquan and Wall Township for Astronaut Russell L. Schweickart, M.I.T. '56, a native of Wall Township, who attended Manasquan High School. Munnie, then the M.I.T. Honorary Secretary for the area, was publicized as having sponsored Schweickart for entrance to M.I.T. "I remember him as a thin, sandy-haired youth," Munnie is quoted as saying, adding, "He definitely wanted to study engineering and he impressed me as a

good prospective student for the Institute." Alex and Munnie were in Florida, where he played golf with *Bob Waterman*. On the way back, they spent a day with Ceil and *Frank E. Huggins, Jr.*, at their new home at Coffin's Point Plantation, Frogmore, S.C. 29920. Squeeze was Munnie's best man and this was their first meeting since that happy occasion 47 years ago. Kim and *Don Morse* stopped over in Sea Girt on their way back from Florida to their Wellesley Hills home. Don and Munnie played golf while Kim and Alex visited Maxine's studio and the three of them went to the local library and a nearby art show where Maxine was exhibiting some of her work. That evening, the Hawes couple hosted a dinner party at our local golf club and we all had one of those thoroughly enjoyable miniature '21 reunions.

A welcome phone call from *Jackson W. Kendall* from his home, 401 Hermosa Pl., South Pasadena, Calif. 91030, alerted us to a television appearance the next morning by *John W. Barriger* on the "Today" show. Billed as "Railroad Historian," John (who is, of course, president of the burgeoning Katy Railroad) showed posters and pictures from his world's largest collection of railroad memorabilia. He spoke on May 9, a neat solution by the network to the observation of the centennial of the completion of the transcontinental railroad at Promontory, Utah, on May 10, 1869, and the fact that Californians celebrated the event two days earlier, the original date set for driving the golden spike now owned by Stanford University. John told of the meeting of the Union Pacific and the Central Pacific now the Southern Pacific, at a point where the railroads no longer operate since the trackage was removed during World War II for scrap metal.

We note with interest that John W. Barriger 4th, '49, a member of the '21 Second Generation at M.I.T. Club, was unopposed on this year's ballot for a directorship on the Alumni Association. Young John is manager of transportation control systems, Sylvania Electric Products Co., Bedford, Mass. The Kendalls had just had dinner with the Barrigers and learned of John's date before the cameras. Marge and Jack left in mid-May for almost two months abroad,

including Portugal, Spain, Morocco, Switzerland, Austria, Germany and the Netherlands. Jack wrote that they stopped over to see Beryl and Dana E. Kepner in Denver on their way back from last November's trip abroad. The Kepners came to see them in March. Jack adds: "We celebrated our 43rd anniversary on March 23. Took friends to see the harbor, the Queen Mary, the Navy station and shipyard, the fish wharves and Ft. MacArthur and topped it off with a grand dinner at the Allen Center Officers Club at the Naval station. It was a perfect day."

Augustus B. Kinzel, 1738 Castellana Rd., La Jolla, Calif. 92037, retired Union Carbide vice president, retired Salk Institute president and founder and first president of the National Academy of Engineering, was granted honorary membership in the American Institute of Mining and Metallurgical Engineers in Washington in February. . . . **Daniel P. Barnard 4th**, Box 313, Bozeman, Md. 21612, retired Standard Oil (Indiana) research head, aeronaut and past national president of the Society of Automotive Engineers, was one of two members of the Class of '21 honored by the American Chemical Society in observance of a half-century of service as a member. Similarly recognized was **Ralph H. Price**, 5810 Trailridge Dr., Austin, Texas 78731, retired administrative director of research and development, American Oil Co., (Texas) and past national director of the society.

Charles L. Beazley, 5735 College St., Halifax, N.S., special consultant to the government of the Province of Nova Scotia, was honored in being designated to represent M.I.T. in the academic procession and ceremonies attending the installation of the Honorary H. P. MacKeen as chancellor of Acadia University. . . . **Samuel E. Lunden**, partner in the architectural and planning firm of Lunden and Johnson, 453 S. Spring St., Los Angeles, Calif. 90013, also represented M.I.T. in the academic ceremonies marking the inauguration of Charles Edward Young as chancellor of the University of California, Los Angeles.

Gustav Frederickson, Box 68, Granby Conn., writes, "I am retired in the quiet town of Granby but am still carrying on as consultant for the Superior Electric Co., Bristol, Conn. . . . **Carl W. Hammond**, 1107 Mariposa St., Vallejo, Calif. 94590, says, "Hope to make the 50th Reunion." Carl is value engineer of the San Francisco Bay Naval Shipyard. We hope his welcome words will encourage the large Lambda Chi Alpha group to join us in 1971. . . . **H. duPont Baldwin** reports a return to his retirement address, 187 Green St., Annapolis, Md. 21401. . . . **Max R. Butter** is vice president of Harry Butter and Co., 151 Mt. Vernon St., Dorchester, Mass., and makes his home in Chestnut Hill. . . . **Morris B. Hart** reports moving his home from Elizabeth, N.J., to Apt. 5H, 4001 S. Ocean Dr., Hollywood, Fla. 33020, and we assume this indicates his retirement as treasurer of Hart Products Corp., New York City

petrochemical firm. How about it?

William L. Knoepke has confused us with another move of his retirement home, this time from 203 Holland Rd., Severna Park, Md. 21146, back south to 3020 N.E. 40th Ct., Ft. Lauderdale, Fla. 33308. Do you have homes at both locations, Bill? . . . **Kenneth A. Moores** writes that his new home address is Apt. 304, 2320 43rd St., E., Seattle, Wash. 98102. The owner of K. A. Moores Co., he is also a trustee of the Seattle Symphony Orchestra. Ken and Alice have three sons, all Ph.D.'s, and there are eight grandchildren. . . . **Hilliard D. Cook**, 806 Williamson Dr., Raleigh, N.C. 27608, says, "I am getting in a lot of fun time that I missed while at M.I.T." After a career in the paper industry, Hilliard has been, for the last dozen years, assistant professor of pulp and paper technology at North Carolina State University, Raleigh. He is active on **Irv Jakobson's** 50-year Gift Committee. . . . **A. Ilsley Bradley**, who heads the real estate appraising firm of A. I. Bradley and Co., 326 Bulkley Bldg., 1501 Euclid Ave., Cleveland, Ohio 44115, says, "Looking forward to our 50th in 1971." Ilsley is also the land agent for Cuyahoga County. Besides golf, skating and bowling hobbies, he claims membership in the S.P.E.B.S.Q.S.A. Translation, anyone?

Both Betty and Assistant Secretary **Sumner Hayward** furnish a steady flow of material for these columns every month. Signed "Assistant to the Second Assistant Secretary of the Lively Class of '21," Betty writes, in part: "I've been corresponding with **John M. Sherman**, 32 Manning Rd., Waltham, Mass. 02154, who says he retired December 31, 1964, from the Boston Federal Reserve Bank where he had been doing economic research for 23 years. Since Masonic history is Jack's avocation, he finds his new occupation as acting librarian of the Grand Lodge of Massachusetts a most congenial one. He has held this position since the first of this year. Jack and Rosabel have a summer home at East Boothbay, Maine. Their daughter, Peggy, is publications editor, Council on International Educational Exchange, United Nations Plaza, New York City." The Haywards visited Marion and **George Chutter** in East Dennis, Mass., this spring. They had word from **Betty Patton**, wife of the late Norman F. Patton, that she is happily back in active service with the League of Women Voters and has been elected to the board of the local oratorio society in Wilkes Barre, Pa.

Hazel and Whitney H. Wetherell, Apt. 2, 108 Robert Dr., Syracuse, N.Y. 13210, wrote they paint and take pictures on vacation trips to Maine. Hazel is Betty's Simmons '23 classmate. White carries on in the engineering training department of Carrier Air Conditioning Co., and retains the honor of being the youngest in the Class of '21. Anyone want to argue? Sumner says Celia and **Frank E. Huggins, Jr.**, sold their property in the Cleveland area after Frank's retirement and have a South Carolina address, reported earlier in these notes by **Munnie Hawes**. Both

Munnie and Sumner sent copies of a long letter from Ceil, telling of their location on St. Helena's Island, one of 67 Carolina Sea Islands, where they have three acres on the ocean on U.S. Route 21, 14 miles east of Beaufort, S.C. They are remodeling an old farmhouse while living in a mobile home a step away. Frank is doing most of the extensive work. A neighbor remarked it was the first time he had seen anyone put up a television antenna and build a house under it.

Kay and Philip A. Nelles, Jr., divide their time between homes at 21 Sunset Rd., Stoneham, Mass., 02180, and Marstons Mills on the Cape. They traveled to Washington, Williamsburg and Yorktown last spring. Phil is a member of the investment committee of the Stoneham Savings Bank. He says he spends Tuesday afternoons marveling at "what people hope to raise a mortgage on!" . . . **Pat and Allen Addicks**, Shore Tower Apt. 612, 1868 Shore Dr., South Pasadena, Fla. 33707, like the St. Petersburg area, where they have joined a golf club which, we hope, is **Ollie Bardes'** Bardmoor Country Club. Al says he couldn't find an M.I.T. alumni club there, but we note P. N. Risser, '63, 217 Bandera Way, N.E., St. Petersburg 33704, is secretary-treasurer of the M.I.T. Club of Central Florida, Tampa. . . . **G. Howard LeFevre**, 20 Gloucester St., Boston, Mass. 02115, says he and Eileen are comfortably located. Moose adds: "We have just begun to enjoy retirement, which really took some doing after my many years of active traveling."

Colonel, Corps of Engineers, retired, and now Professor **Victor S. Phaneuf**, reports a new home address at Apt. 155, 3425 S.W. 2nd Ave., Gainesville, Fla. 32601. Vic retired as chief construction engineer of L. P. Porter, Inc., Beverly, Mass., and is now associate professor of building construction, University of Florida. . . . **Anne and George Schnitzler** have journeyed from Miami Beach winter quarters to 32 Gerry Rd., Chestnut Hill, Mass. 02167. George is one of many to whom we send sincere thanks for writing to 47 Gerard St., Manchester, Conn. 06040, to cheer up **Ray St. Laurent**, convalescing from his hip operation. . . . Apparently retired, **Carl Thumim** has advised of a move from Chicago, Ill., to 6 E. Gilman Circle, Margate, N.J. 08402. . . . **Robert R. Whitehouse** has closed his winter abode in St. Petersburg Beach, Fla., to spend the summer at his home in Windemer Park, Unity, Maine 04988, where he operates the Maplewood Lumber Co. . . . **Richard P. Windisch** has retired as partner and financial analyst of W. E. Burnet and Co., New York City, and can be addressed via Box 2005, Naples, Fla. 33940. . . . **John N. Worcester** says his home address is Claybrook Rd., Dover, Mass. 02030. He maintains an office in Boston as the senior partner of the civil engineering firm of Sullivan and Worcester.

Thomas W. Bartram writes: "After 44 years, Billie and I have sold our house in

St. Albans, W. Va., and have a retirement home at 9582 141st St., North, Largo, Fla. 33540. We are just over the northern border of St. Petersburg. I note many names of M.I.T. alumni in the area and assume there is an M.I.T. Club nearby. I phoned Marty and Bill Ready that we would move here. Their Clearwater home is only seven miles away. Also Patty and Allen Addicks are not far in South Pasadena." Tom retired in 1961 from Monsanto's research laboratory in Nitro, W. Va. We hope he, too, will join Ollie Bardes' Bardmoor Country Club nearby in the Seminole area off Starkey Rd. . . . Belatedly we acknowledge a grand letter from William J. Sherry, 1801 First National Bldg., Tulsa, Okla. 74103. Bill tells of visiting son Dick, a senior at Notre Dame, and attending sessions of the American Petroleum Institute. Older son Bill Jr., is on a destroyer in the southwest Pacific and editor of the ship's news releases. . . . Saul M. Silverstein, chairman of Rogers Corp., Rogers, Conn. 06263, says, "Spent two wonderful days at Arden House on the Harriman (N.Y.) campus of Columbia University, attending the excellent seminar sessions, 'Strengthening Management for the Seventies,' sponsored by the M.I.T. Alumni Center of New York. I was the eldest of 60 participants!" Saul enclosed the extensive program presented by authorities from industry, government and educational institutions.

Picknicking Florida style

Philip R. Payson, 5031 Northampton Dr., Tanglewood, Ft. Myers, Fla. 33901, tells of the well-attended spring picnic of the M.I.T. Club of Southwest Florida (Box 2271, Sarasota 33578, for newcomers to the area) at the home of Bill Grunwell, '28, on Lemon Bay. Marion and Phil drove 60 miles from Ft. Myers. He says, "We enjoyed fried chicken, apple pie, and all that went with a swell meal. More than 60 arrived by boat and docked at Bill's wharf along the Intracoastal Waterway. Richard J. Spitz also was present." Phil sent the club's flier, with its complete directions and appealing description of the day's activities.

Anne and Wallace T. Adams, 2606 Fleming Rd., Middletown, Ohio 45042, describe an exciting trip to Yucatan and Cozumel after we all left the Fiesta of the M.I.T. Club of Mexico City last March. They drove east in May to attend the annual meeting of the National Council of the Boy Scouts of America in Boston. Then, in company with Elma and John B. Mattson, Winthrop, Mass., they spent the next several weeks in Nova Scotia and the Maritime Provinces before returning to Cambridge for the M.I.T. Homecoming in mid-June. . . . We have a warm personal letter from Viviano L. Valdés, Edificio Centro de la Industria, Manuel Maria Contreras No. 133-304, Mexico 5, D.F., in which he sends regards from Maria Helena and himself. . . . Helen and Raymond A. St. Laurent are back at their home, 47 Gerard St., Manchester, Conn. 06040, where he is recuperating from his hip operation at Massachusetts General in Boston. We hope you will write him a

note of good cheer or phone him at 203 643-6056.

Class Vice President Irving D. Jakobson served as chairman of the advisory committee for the M.I.T. Eastern Conference held last March in Garden City, N.Y. Jake sent us a clipping from the *American Banker*, with a picture of Harold H. Cake, whom we haven't seen since graduation. Cookie has been elected chairman and chief executive officer of the Equitable Savings and Loan Association, Portland, Ore., of which he has been a director since 1946 and president since 1963. He is a member of the advisory council of the Federal Home Loan Bank Board, past president of the Oregon Savings and Loan League and a former director of the Federal Home Loan Bank of Spokane. He lives at 5046 S.W. Hilltop Lane, Portland, Ore. 97221. Do you ever hear from Bill Matthews, Cookie? . . . Ralph M. Shaw, Jr., president, Pedrick Tool and Machine Co., 3640 N. Lawrence St., Philadelphia, Pa. 19140, wizard of fabricating machines to cold form metals, has another new one he calls "Shaw's Folly." An unconventional bender, the raw material goes in from either end and ejects to either end after being formed. It is expected to be Rufe's patent No. 27.

Betty and Dugald C. Jackson, Jr., Tetra-stemma, Harmony Hills, R.F.D. 2, Havre de Grace, Md. 21078, toured Florida and visited Muriel and George Owens. They also saw Wilma and John Scott and Betty and Herb Nock. John and Herb are retired but we have had no word from either of them for many years. The Jacksons also visited Graciela and Helier Rodríguez in Tampa. Dug says they contemplate a month in Scandinavia this summer. . . . Reunion Chairman George A. Chutter, Boulder Dr., East Dennis, Mass. 02641, has an unfailing record of sending us a letter every month and we sincerely appreciate his contributions to help maintain these columns. Chut has visited Helen and Ray St. Laurent in Massachusetts General Hospital. He reports seeing Mich Bawden, Josh Crosby, Ed Dubé and Ace Rood at Alumni Council meetings. Others of the Class on the Alumni Council this year are Warrie Norton, past president; Bill Sherry, past vice president; Cac Clarke, Ed Farrand, Irv Jakobson, Chick Kurth and Ray St. Laurent. Chut also says he hears from Fritz Ferdinand and that he had lunch with Paul Rutherford, who spent last winter in Tucson.

A phone call from Marge and Jack Kendall from Kennedy Airport just before hopping off for Europe told of their being met by friends and having phoned Helen and Ray St. Laurent. . . . John M. Giles, 911 Live Oak St., San Angelo, Texas 76901, phoned to say he saw Bob Waterman in Delray and Harry Junod in Naples, Fla. He had tried to reach the elusive Jim Parsons in New York. (Where are you, Jim?—Cac.) Jack and Louise were about to leave from New York for a trip to Lisbon, Spain, North Africa and England, returning during May, with a possible stop in Cambridge for Homecoming Day

in June before going back to Texas. Earlier, they had taken a Caribbean cruise. . . . Joseph Wenick, 37 Cedars Rd., Caldwell, N.J. 07006, phoned a special invitation to join the past presidents of the M.I.T. Club of Northern New Jersey to hear our revered Emeritus President Jay Stratton, '23, speak on "The Ocean and National Priorities" at the club's annual meeting. Some 16 of the 27 living past presidents attended and your scribe had the pleasure of making the introductions. Joe retired after 14 years as club treasurer and was made a life member of the board of governors. He also was appointed secretary-treasurer of the second annual state-wide conference of the Service Corps of Retired Executives (S.C.O.R.E.), held in Princeton in May. . . . Ed Farrand again phoned several times from his La Jolla, Calif., home to discuss Class affairs and give us news for these columns.

In Memoriam

We sadly report the loss of two members of the Class of '21 and extend to their dear ones the sincere sympathy of the entire Class. . . . Herbert Von Thaden, 1101 N. Main St., High Point, N.C. 27262, died on February 8, 1969. Born February 21, 1898, he prepared at the University of Cincinnati and joined us in the junior year. A member of Kappa Sigma, he was active at M.I.T. in the Aero Society and as secretary of the Mechanical Engineering Society. He was graduated with us in Course II and became assistant to the chief engineer of Aircraft Development Corp., Detroit. He was later with U.S. Steel in Pittsburgh and then started the Thaden-Jordan Furniture Corp., Roanoke, Va., of which he was president and general manager. He later founded the Thaden Engineering Co., and was engaged in research and development of filament winding process equipment. His family included a son and daughter. Thad had many interests and we wrote of him in the February, 1925, issue of the *Review*; "Herbert Von Thaden, representing the Detroit Aviation Society, just missed finishing among the first three when, in the National Balloon Race which started at Kelly Field, San Antonio, Texas, he landed his 80,000-cubic-foot balloon near Dubuque, Iowa, having covered 1,003 miles in 34 hours, only 18 miles less than that of the third-place winner. In addition to Army flying experience, Thad carried out experimental flying and laboratory work for the National Advisory Committee, Langley Field, Va., and had been technical assistant of the Air Ministry in England. He studied aeronautics in France and Germany."

William Fuller Lawrence, 6441 Horton Circle, Norfolk, Va. 23513, died on April 15, 1969. A native of Brockton, Mass., he obtained a B.A. degree from Bates College in 1919 and entered M.I.T. in our senior year. He received the C.P.H. in Course VII and joined the health department of the city of Portsmouth, Va. He later earned an M.P.H. degree and continued his career as bacteriologist and assistant to the director of the department of public health in Portsmouth.

The *Review's* current volume ends with this issue. Please be sure to join us for the next volume, starting with the October/November issue, which will come to you via your annual support of the Amity Fund. We hope to see many of the Class at the Alumni Officers' Conference in Cambridge on September 4, 5 and 6. It will be followed by the popular Alumni Seminar. Meanwhile, take a few minutes to write a note to your secretaries and enclose a photograph suitable for use in the *Review*—preferably a 5"x7" glossy print—but don't procrastinate and fail to write just because you don't have a picture handy. Make certain you and your wife plan now to attend our one and only 50th reunion, June 10 through 14, 1971. A happy and enjoyable summer to you and yours.—*Carole A. Clarke*, Secretary, 608 Union Lane, Brielle, N.J. 08730; *Edwin T. Steffian*, Assistant Secretary, Steffian, Steffian and Bradley, Inc., 19 Temple Place, Boston, Mass. 02111; *Sumner Hayward*, Assistant Secretary, 224 Richards Road, Ridgewood, N.J. 07450

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In sending greetings and salutations to the greatest classmates ever, your secretary is only reflecting his joy upon returning to the United States from another adventure in Communism. The experiences of the members of our Trade Mission were most satisfactory, the accommodations were excellent and the meetings and interviews with government and business representatives were most congenial, constructive and informative. Newspaper reports of happenings in Eastern Europe become much more meaningful after having even a short visit with government representatives of Czechoslovakia, Hungary, and Romania. Considering their geographical location and the attitude of their neighbors, the citizens seem to be trying to work out a future for their respective countries in the best possible manner while recognizing existing conditions. During our absence we were happy to receive a beautiful colored print of *Lophornis magnifica* photographed by *Crawford H. Greenewalt*. Our thoughtful Alumni News Editor also remembers her far-flung staff.

Professor *Warren E. Howland* of the Department of Sanitary Engineering at Purdue University at West Lafayette, Ind., represented M.I.T. at their Founder's Day ceremonies in May to commemorate Purdue's centennial year. . . . *Gerald C. Pearce* of Liverpool has retired to Charlton Kings, Cheltenham, Glos, England. *Norman L. Apollonia* writes inquiring about his 1922 classmate "any news of Ward Edward Shearer?" . . . *Donald B. Marsh* has retired from Charles T. Main, Inc., of Boston and is now at 4 Whig Street, Dennis, Mass. In his opinion, R.O.T.C. should be retained at the Institute. . . . *Paul S. O'Brien* has been busier than ever since retiring from Mobil Chemical Co., in 1965. He is Chairman of the Baton Rouge Council on Alcoholism and attended the International Congress on

Alcoholism in Washington, D.C. in 1968. He also is writing articles for a magazine in Dublin, Ireland. In June 1966 he attended the International Congress on Alcoholism and spoke in Prague, Czechoslovakia. . . . *Herbert O. Albrecht*, retired, Bartol Research Foundation, Springfield, Pa., has been honored by the American Chemical Society and will receive a special pin and badge at the presentation of a certificate.

A most welcome note from "White Birches" announces the new home of Catherine and *George Dandrow*, Box 425, Jaffrey, N.H., 03452. George writes: "Hi Whit—answering the question in the April '22 notes, the shingles on the Chatham house were O.K! This was not enough to keep us on Cape Cod. Would that I had the talent of classmate Hodgins! (Mr. Blandings Builds His Dream House). I'd make a million dollars. Looking back to nearly 40 years in New York City, the standards of the people and the institutions seem almost convent-like after Cape Cod! We are now in hill country and love it. Hopefully this environment of tranquility and decency will persist for whatever time the Master has down for us. There is a friendly doorbell for you and any of the '22ers hitting this beautiful Monadnock Region of New Hampshire. Suggest a phone call to be sure we are here (603)-532-7622. See you all Alumni Day. Best-George."

We also bow gracefully to *Herbert C. Ham* who has written that he was at Lake Worth, Fla., for February and March and spent some small time visiting with *Frank Kurtz* on the streets of Delray during his bicycle tune-up. Herb also stopped next door and found *Ted Riegel's* home. He had a nice visit with Mrs. Riegel. Herb also suggested that he may spend part of this spring in Ireland to check up on "classmates living in the shadow of the Blarney Stone."

C. Ford Blanchard has written that his ever-loving wife Mabel remarked about the lyric quality of *Chet Greening's* writing. Ford continues: "A second Thoreau, I would call him for, while Westport isn't Walden Pond, Chet certainly lives the theme that: 'My life is like a stroll upon the beach as near the ocean's edge as I can go.' The stay with him was truly delightful, though it rained almost the entire fortnight during which I visited various New England spots, including the Institute. On the occasion of that visit I spent nearly an hour trying to find parking space somewhere in that vicinity. There really ought to be some place where a visiting alumnus can head in with an automobile, short of having to park in Boston and take the subway out to Kendall Square.

"In my last missive I told of my retirement (effective September 30, 1968) from the Federal Power Commission. On this occasion I must now report that, having retired I have now been rehired, so to speak, for I have since assumed responsibility as Financial Editor of *Public Utilities Fortnightly*, a magazine of sorts

which, strangely enough is devoted to following the economic and regulatory fortunes of the public utility industries, principally electric, gas, telephone and water. Even more curiously, it is published every two weeks and is edited here in Washington. The publishers are Public Utility Reports, Inc. Getting out my contribution keeps me busier than I ever was in my F.P.C. days. While I am in this reflective mood, I must confess considerable disappointment over the fact that our fiftieth reunion is to be so near to, and yet so far from Boston, Cambridge and the smog. Sincerely yours, Ford."

C. Yardley Chittick was secretary of our Class for a great many years and has always continued to supply notes in a most helpful way. He has written that he missed class notes while he was in Florida in April but did meet several friends. Yard enclosed an April 11 clipping from the Boston *Herald Traveller* announcing memorial services for *Joel Harvey* of Duxbury and Portland, Maine. Joel was a retired partner in the firm of Lybrand, Ross Bros. and Montgomery, Certified Public Accountants of Boston. He was a member of the American Institute of Certified Public Accountants, past president of the Massachusetts Society and a former president of the Board of Directors of the Brimmer and May School. He was a member of the Cumberland Club of Portland, the Duxbury Yacht Club and the Union Club of Boston. The sympathy of our Class is extended to his family.

We also send our sympathy to the family of *John F. Halpin*, who passed away in his home in South Nyack in March. John had retired in 1965 after 40 years as design engineer for the New York Central Railroad. He was a Navy Commander in the South Pacific from 1939 to 1946 and retired with the rank of Captain after serving until 1960 as Commander of the Navy Reserve Unit in Yonkers.

Among the new addresses received are: *Thomas E. Shepherd*, St. Petersburg Beach, Fla., 33706; *Gerald C. Pearce*, Cheltenham, Glos, England; *Allen S. King*, 3540 James Ave., So., Minneapolis, Minn. 55408; *Raymond E. Miskelly*, Yarmouth Port, Maine, 02675; *Platt C. Benedict*, St. Augustine Drive, Glendale, Calif., 91206; Colonel *Ross B. Warren*, Corpus Christi, Texas 78411.

These notes include a most sincere welcome to *Oscar* and *Mary Horovitz* upon their return from Florida and to our other classmates coming back from warmer climes to places hopefully as beautiful as a certain city at the east end of Lake Erie named after a monstrous, shaggy headed animal but also after the *Beau Fleuve*, our beautiful river. Best wishes to you all for a relaxing and uneventful summer.—*Whitworth Ferguson*, Secretary, 333 Elliott St., Buffalo, N.Y. 14203; *Oscar Horovitz*, Assistant Secretary, 45 Gerard St., Boston, Mass. 02119

23

From *Walter Dietz* we have the following: "We sure had a great time visiting the M.I.T. Club of Mexico City. They were most gracious hosts, all of them. Mrs. Dietz and I said that we had never seen an affair better organized. . . . They made everyone so at home in spite of the fact that 95 per cent of those attending did not speak Spanish. Our Class had a good representation, there were seven that I met. . . . We stayed on an additional week . . . most of it in Ixtapan. What a delightful place and reasonable too. . . . Well Tom, we missed you too." Also from *Herb Hayden* we hear in more detail. "The following . . . of our Class were there: *Dave* and *Isabel Skinner*, plus four guests (not wives), *Bert* and *Harriet McKittrick*, *Walter* and *Elsie Dietz*, *Alan Allen*, *Dave Kaufmann*, Mr. and Mrs. *Lloyd Lockley*, *Herb* and *Kay Hayden*. . . . We all had a marvelous time—never a dull moment. He goes on further to tell of his accident on the way to Mexico. "Kay and I were driving to Florida and in Lumberton, N.C., we were hit from the rear, turned complete-over and spun around. Car was demolished and we could not get out without outside help. Seat belts saved us from serious injury. . . . We rented a car and finished our trip to Florida, then flew to Mexico and then . . . had to fly home." Quite an experience we would say.

From Class President *Howie Russell* we have another interesting bit to report. "Just a note to let you know that we have returned from Arizona and liked what we saw so much that we have contracted for a house to be built for us there. It will be ready for us some time this fall and we hope that we will be able to get there in time for Thanksgiving. However, the exact time is uncertain. . . . The address then will be 10026 Waikiki Drive, Sun City, Arizona 85351. The place will be a three bedroom affair . . . two baths, living room, dining room, kitchen, enclosed lanai . . . just off the 14th tee of a new golf course. . . ." Sounds great *Howie*! How will you manage to get along without all that New Hampshire snow in winter?

From *Dorothy Nowell* we can now advise more about the passing of her husband *Joseph C. Nowell, Jr.*, in March of this year. She writes: "The reason I am so late in answering is because I only received your letter yesterday. Joe's mother . . . aged 91 . . . died last Wednesday April 2, the day we had a memorial service . . . here in Schenectady. . . . Joe died from a heart attack so he didn't suffer. He lived every minute of every day until the very end." Joe retired from G.E. in 1966 as manager of engineering and construction. He served three years in the U.S. Navy during World War II as Commander and C.O. of the 113th Battalion of Naval Seabees. Born in South Dartmouth, Mass., he received his S.B. with our Class in civil engineering. He was with Stone & Webster for eight years, followed by four years

with the Duluth Superior Dredging Co., as district Superintendent. Up until his war service he was with the Tennessee Valley Authority in several important executive positions. He was a licensed professional engineer in New York, New Jersey and Massachusetts and was a member of Tau Beta Pi, A.S.C.E. and the American Concrete Institute.

We have also just learned of the death of *Shepard S. Weinbaum* on February 1, this year. As soon as we have more information we shall cover this sad matter also.

We see by our local newspaper that *George W. Bricker* has recently joined the staff of *Todd Kendrick Associates* of Wilton, Conn., a firm engaged in executive and technical recruiting. George has had a long career in management consulting and organization counselling. He was formerly a principal in *Robert Heller and Associates* of Cleveland. He was also a member of the Post Office Task Force of the first Hoover Commission. George tells me that he is not slowing down one bit and is more active than ever in new enterprises and advisory services.

From *Pete Pennypacker* we are most pleased to learn that his recovery still continues and that he eagerly awaits receipt of those voluminous Class of 1923 files which are going to be gone over by the two of us soon. Incidentally, where is the interest of someone to be in on the act with us and collect what is needed to write a class history? We would welcome a volunteer to help. How about you *Horatio Bond*?

Does anyone know the new address of *Felipe Diaz Ossa*? The last two communications to him have been returned. (Last known address was P.O. Box 84D, Santiago, Chile, CHL55).—*Thomas E. Rounds*, Secretary-Treasurer, 25 Ridge Rd., Danbury Conn. 06810

24

This is going to be the shortest column of the year. Unfortunately the timing is such that we can't tell you anything in the past tense about our 45th. That will have to wait until the first fall issue. Can't even tell you of the Survey Trip of Task Force #2 scheduled for late May. We're going to give Bald Peak a thorough going over at that time. Hopefully the ice will be out of the northern part of *Winnepesaukee* by then, but we have no plans to test the bathing facilities. We shall, however, test the competence of the Club's bartenders, and look into other essentials.

Northern New Hampshire is not the last place in the U.S. to give up winter grudgingly. Would you believe California? A note from *Mark Sinnicks* in Oakland says they are planning an extensive trip with the reunion as the focal point. "Our summer place near Sonora Pass registered 18 feet of snow this past winter. We don't expect to get in to open up until around 1 July when we return from the East. P.G.&E. runs snow surveys by

helicopter, so we can keep a check on when roads will be open and fishing starting." Mark is retired and has the feeling common to so many of us: "Retirement rolls along beautifully. Wonder how I ever found time to go to work."

Nip Marsh retired a year ago, and as evidence that time passes in a leisurely fashion, he was looking through his Christmas cards in April, although he didn't say it was for the first time. In any event, he found our reunion letter mixed in with the cards, "I had been looking for it for some time," and hastened to send in a reservation. *Nip* has not forgotten his old swimming prowess, and is now passing it on to another generation. "We moved to *Annisquam* (Mass.) and bought a mid-Victorian house and cottage. Lots of time to do the things I want to. We have a 20' by 35' pool in the backyard, and cater to the *Annisquam* kids. We have as many as 20 and up for swimming, and I coach a few of them. May find a star someday. Some sailing and garden and yard takes most of my time. Our group is now 8 grandchildren including married ones, and 2 great-grandchildren. One grandson is captain of the *Taber Academy* crew and represents the U.S. at the *Henleys* this summer. We may go over also."

Dick Shea makes an observation that many of us will be repeating in the near future. "It is amazing how some of our classmates seem to have aged only moderately, are as recognizable the first time you see them as they were 45 years ago, whereas others have changed greatly—and I don't mean merely on top and in the middle. I do enjoy getting together with them all again, though." Quite true, and not just our physical appearances but our thinking has changed appreciably, too. How many people today remember us as the Lost Generation? What with jazz, bathtub gin, dates who parked their girdles (or were they corsets?) at the checkroom, and flouting all speed and traffic laws in our Model T's, there really wasn't much hope for us. Now, in this era of LSD, unwashed hippies, and student uprisings, we are stodgy oldtimers, champions of the status quo. Wonder what the Class of '69 will be like at its 45th? Will they be as aghast at the students of that time as we are now, or as the Class of '79 was at us? Probably.—*Henry B. Kane*, Box 177, Lincoln Center, Mass. 01773

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Plans for the 45th Reunion were put in active motion at a luncheon on May 8, 1969. *Sam Spiker* met with *Ed Kussmaul*, *Jim Howard*, *Fred Greer* and your secretary, with *Fred Lehmann* and *Panos Spiliakos* from the Alumni Office. Due to the fact that *Fred Greer* is going to be away from the Boston area a great deal during the coming year, he felt that he could not continue as Chairman of the Reunion Committee, and *Ed Kussmaul* has graciously agreed to take on the task. *Jim Howard* has volunteered to be-

come the Deputy Chairman. Many of you will be hearing from Ed in the near future, I am sure; he will be asking for assistance from many of you in the planning for this important reunion. It is hoped that any of you who are asked to participate will see your way clear to give Ed a hand. The Bald Peak Colony Club in Melvin Village, New Hampshire is still the location from Friday afternoon, June 12, 1970 through Sunday, the 14th; and you will hear of special arrangements being made so that you may stay on campus on Sunday night and be present for the Alumni Day affairs on Monday, June 15, 1970.

The Getty Oil Company of Madison Avenue, New York City, in its March 1969 house organ announced the death of *George C. Caine* in February 1969. George had retired in 1968 as the Eastern Division manufacturing manager and passed away at his Landenberg, Pennsylvania home. He joined the former Tidewater Oil Company in 1926 as a chemical engineer at the Bayonne Refinery in New Jersey and held various technical and supervisory positions at the refinery until 1943 when he was appointed General Superintendent. He was named Eastern Division Manufacturing Manager in 1956 after successfully directing and coordinating all activities relating to the planning, design and development of the Delaware Refinery located 15 miles south of Wilmington. He served in this position until his retirement in 1968. He was born in Wissahickon and was raised in Conshohocken, Pa. He planned from an early age to study engineering and after completing high-school at Mercersburg Academy he entered M.I.T.

We are sorry to report the death of another classmate, Colonel *Lewis M. Van Gieson*, at Rochester, New York on January 18, 1969.

Sam Spiker as a self-appointed representative of the Class of 1925 reports on the wonderful time the *Gates Burrows*, *John Campbells*, *Frank Frickers* and *Sam Spikers* had at the 21st Annual Fiesta at Mexico City last March. He points out that the M.I.T. Club of Mexico City did an outstanding job in planning and executing this delightful, entertaining and educational three-day affair. Their warm hospitality was unbounded.

Retirements still seem to make the news. *Charles E. Peterson*, Assistant Engineer in the Architectural Department of the Milwaukee Railroad, retired last January after 42 years of service with the company. His colleagues gave him a cake and coffee party on the date of his retirement and presented him with a wallet containing a sizeable farewell remembrance. Charlie was born in Spokane, Washington and still has many close ties in that area. Following his graduation from M.I.T., he joined the Railroad as a rodman at Mobridge, South Dakota and later served as rodman and instrumentman at Deer Lodge and Miles City, Montana; Seattle; and Savana, Illinois. He became Assistant Engineer in 1939,

working out of Aberdeen, South Dakota; and from 1943 to 1951 served in the same capacity at Spokane before being transferred to the Chicago Headquarters. Charlie and his wife, Ruth, spent the winter at their home in Lake Forest, Illinois, but left this spring to resume construction on a new home they are building at Athol, Idaho. The site is a beautifully wooded tract bordering the national forest north of Coeur d'Alene. They plan to do much of the work themselves, as a retirement project.

The Rensselaer Polytechnic Institute Alumni News in April noted that among the retirees this spring was *G. Franklin Guilford*, Associate Professor of Mathematics. He was appointed Instructor in the Department of Mathematics at Rensselaer in 1946, having previously been Instructor and Head of the Mathematics Department at the Manlius School in Manlius, New York and an Instructor in the West Point Preparatory Program at Cornell University. He and other members of the faculty who retired this year were honored at the Faculty Retirement Recognition Dinner on Thursday, April 24. Each of the retirees was presented with a Rensselaer Chair, and photographs and mementos of the evening.

A note from *Arthur Odegard* indicates that he will retire on June 20, 1969 after 40 years with the Massachusetts Department of Public Works.

From *Don Taber* comes word that he enjoyed three months in "sunny" but not "hot" Boca Raton, Fla., this past winter.

Just as these notes are being completed, "*Kamy*" *Kametani* dropped in for a chat. He is on another one of his round-the-world trips, taking him to Minneapolis, Boston, and Denmark. On his return to Japan, he will stop in Rome and Hong Kong as well. Kamy is busier than ever and having a good time. While in the Boston area, he spent two nights with *Arthur Odegard*.—*F. L. Foster*, Secretary, M.I.T. Room 4-144, Cambridge, Mass. 02139

26

We have a few minutes prior to what is designated on the schedule as the Imbibement Hour here at a place in the Pennsylvania Pocono's called Tamiment. This is the last such duPont meeting your secretary will attend prior to retirement next fall. Men are here from all over the world and the timing is good since originally it was set for next year and I would have missed it. Recently, prior to a trip to Los Angeles, we wrote *Dan Bloomberg* to arrange a get together. On checking his address in the Alumni Register we noted RET after his name and mentioned this in the letter. By air mail came the annual report of Republic Corp., with Dan's name second on the masthead, vice president and secretary, and a note quoting Mark Twain that such reports about him were grossly exaggerated. We had dinner with Dan and his wife Jean

and the next day he took me to four of their plants in the Los Angeles area. On our last visit ten years ago, Republic was a movie producer but new ownership spun off the entertainment end of the business and retained a plastics company in Scranton, Pa., as a nucleus for purchasing additional plastics and related manufacturers. I became so interested in the companies' activity that Dan has arranged for me to visit the Scranton Plastics plant tomorrow while my associates are golfing. Pause. . . .

It's now tomorrow and this time there are a few minutes before the breakfast room opens, so let's see what I put in the '26 envelope before leaving home. The first is an address change for *Bill Forrester* to Manchester, Vt. This is getting a bit boring changing Bill's address twice a year—to Hawaii in the fall and Vermont in the summer. There seems to be no other significant change in about a dozen, except that it appears that *George Leness* is now using his home address of 31 East 79th St., New York City. A few of the notes that you write on the back of the Alumni Fund envelope come in handy at a time like this. Here's a corker. "No new news. Regards to all for a good 1969. *Dwight K. Taylor*." What's the answer to that—no news—good news? One from *Charles D. Batchelder*: "Retired from Portland Pipe Line Corporation November 1, 1966. (Chief Engineer from 1943 to 1968.) Previously with Lago Petroleum Corporation in Venezuela, from 1928 through 1943." And here are two more telling of their retirement. *Francis A. J. Brown* says, "Retired November, 1967, from Armstrong Cork Company. Outdoors in garden or Adirondacks. Community Service projects. Hoping to get back into poetry or poetic prose." And *Russel D. Carlson*, "Retired to northern California after 20 years at Universal Pictures in sound department." And a final one from *G. Richard Peterson*, who I believe retired some time ago. "Just to say hello George and enjoy the Class News. Enjoying good health and the wonderful California weather. I apologize to my New England classmates, but it is the truth."

This being the last issue before summer, we extend our usual invitation to those who get to New England to drop by Pigeon Cove. We are getting the sailboat ready to put overboard and look forward to an active racing season. In mid-August our fleet will host the "Bullseye" National Championship Races so we are really bringing in the competition. If you do not make it to New England, please send a note or post card so we will have something to start with in the fall. Have a nice summer! Cheerio until the October/November issue.—*George Warren Smith*, Box 327, Pigeon Cove, Mass. 01966

27

Coming into the last notes of this season, there are some items to report. Again, regrettably, we have only now received word of the death of Rear Admiral *Harry*



W. J. Smith, '28

D. Hoffman in March, 1963. He received his S.M. degree in mechanical engineering with our Class.

We have word of the death of *Francis H. Littrell* on June 25, 1968. He received a bachelor's degree in mechanical engineering in our class. His home was at 1205 Pine Road in Omaha.

Emory F. Patterson, who was with Stran-Steel in New York, has a new address at 35 School St., Brunswick, Maine. . . . *Dick Cutts*, retired from G.E. and now a travel consultant, was in Boca Raton, Fla., this winter and has now returned to his Warwick, R.I., home at 21 Lombardi Lane. . . . *Bob Bonnar* writes that all is well with him and with *Rosie Rosenthal* and *Ray Hibbert* whom he has seen recently. Ray, in his turn, had seen *Jim Lyles* and reported him as better than OK.

Signs of the times! The grand old Griswold Hotel in Groton, Conn., on the east bank of the Thames River—once famous resort of millionaires and later the scene of our 15th reunion—was recently purchased by neighboring Chas. Pfizer & Company, pharmaceutical manufacturers, and torn down. The Pfizer company has not yet announced the future use of the property. The hotel was the largest wooden structure in New England.

Paul Vaughn is not going to retire on Cape Cod after all, but is building a house in Toms River, N.J. Completion is scheduled for late June—right after his daughter's marriage. . . . *George Thacher* and his wife are on a world tour; won't be back until October. . . . *William M. Crane, Jr.*, has retired from Anaconda American Brass Co. . . . Baldwin Wallace College has convinced Professor *Theodore Bogardus* that he should stay for an extra year as professor engineering, despite his having reached 65. He writes "Anyone needing a 2 acre to 200 acre industrial site in the great state of Ohio, see me." He owns and is selling off an 850 acre industrial park 15 miles southwest of Cleveland. . . . *William E. Tucker*, who retired from R.C.A. four years ago, is moving from Haddenfield, N.J. to California this summer. . . . *Fred M. Harrington* has moved from Allentown to Bethlehem, Pa., 1317 Prospect Ave. . . . *Jules Friedman* has now been operating his own

business since 1937. It is Merit Plastics at 30 Lincoln Pl., Lynbrook, N.Y. . . . *Charles T. Barker* has moved to Apt. 20, 3643 NW 13th St., Wichita, Kansas 67203

The notes of July 1944 said that *Bob Bonnar* was technical director of General Dyestuff Corp. . . . *Frederick S. Erdman* was promoted to the post of associate professor of mechanical engineering at Cornell. . . . *Low Baker* has just married and *Art Connell's* wedding was just in the offing.—*Joseph S. Harris*, Secretary, Box 654, Masons Island, Mystic, Conn. 06355

28

With the incoming of warm weather we have an influx of retirement notices. The list includes *Harold Geiger* who has been manager of the Chicago district office of the International Nickel Company since 1935. We also note that *Peter Zugale* retired from the New Jersey Bell Telephone Company on March 1, after nearly 40 years in the company. From the alumni office we are told that *Leon P. Gaucher* now living at R.F.D. 1, Fishkill, N.Y. 12524, is due to retire from Texaco on August 1, after 41 pleasant and profitable years. Leon plans to write and lecture on energy and energy utilization. And from a happy note sent by *Charlie Worthen*: "The purpose of this rare communication is to supply you with a little item for the class notes. I had a short note from *Jerry McGillivray* who has been with *George A. Hormel & Company*. He says: 'I have just gone through a formal retirement as of March 1, and I am staying on in a consulting and brokerage basis.'"

From *Al Gracia*: "Dear Herm: It was good of you to acknowledge my clipping and therein 'needle' me for more information. We plan to keep our Akron home where the spring and fall weather is most enjoyable. We will be in Maine in the summer. We built a chalet there last summer on Lake Cobbosseecontee near Winthrop. For the miserable winter which Lake Erie affords us, we will be in St. Thomas, V.I. as we have for some years now during February's meanest days. Only now we can duck most all of it. Which reminds me that I ran across the Sid Browns last February on the ferry which takes the Water Island folks to the main island of

St. Thomas. Sid and Syd were staying at the Water Island Colony Club. We had a short visit and they were on their way again. I've enrolled with the International Executive Service Corps and hope I can be of some service through that organization. Best wishes, Sincerely."

During a recent telephone conversation with *Jim Donovan*: "One evening I wanted to know what was going on at Cornell so I called our old friend Benny Huff—Benny was home working on the index for the reissue of his famous book. He said Margie was over on the Grecian Islands with a group of women taking in the art (as usual), Benny said that he was looking forward to a grand reunion, the next one on Cape Cod!" Jim also noted that many of our classmates "participated in establishing the Warren K. Lewis Professorship of Chemical Engineering—*Herb Dayton, Jim Donovan, Don Fraser, Al Gracia, Johnny Hartz, Bob Jack, Nap Lacroix* and *Don Sturznickle*."

From the back of an Alumni Fund envelope from *Victor Decorte*: "Alice and I just returned from a three months trip to South Africa and Mozambique. Made the round trip by steamship (Lloyd Triestino). Stopovers in Spain, Canary Islands and Ougola. Our stay (3 days) in the Kruger National Park was really splendid. After seeing so many wild animals in their natural habitat, we do not want to visit any more zoos!"

And from *Fritz Rutherford* in a letter dated April 20: "It is with regret that we are not having the 40th reunion over again this June. The year has passed fast but the grand reunion memories still stay with us. Jo and I are still retired here in South Carolina and enjoying life to the fullest. It is a pleasure not to have snow but good hunting, fishing and golfing down here in the Sea Islands. Well, we are taking off on another short trip. This time, we are going to England, Scotland and Ireland for six weeks returning in early June. Our last big trip a year ago was through the South Sea Islands, New Zealand, Tasmania, Australia, Singapore, Bangkok, Hong Kong, Taiwan, Japan and the outer islands of the Hawaiian group. It might interest you that we have had two small companies from Massachusetts and Connecticut move down here in our

immediate area. Give our best regards to Jim, Abe and the rest of the Class."

From a mid-west trade magazine we learn that *Robert Jenks*, Course 4, who has been with the Kansas City archaeological firm of Linscott-McArthur & Associates since 1962 has been an elected associate of the firm. As some of us remember Robert is a graduate of the University of Kansas and received his masters degree with our Class. From the alumni office we are notified that *Johnny Hartz*, 1027 Perry Drive, Akron, Ohio 44313, represented the Institute at the inauguration of Ronald G. Weber as the seventh president of Mt. Union College.

And now for the sad news. *Vincent Caputo* of Winchester died April 22, 1969. He was President and Treasurer of the Vincent R. Caputo General Construction Co., of Winchester. He left his wife Lucille, his mother, two daughters, four brothers and a sister. I know you all join with me in extending our deepest sympathy to his dear ones.

It is also our sad task to report the death of *William Loomis* of Bemus Point, N.Y. on November 11, 1968. Bill was Course 15 and, as I remember it, retired two or three years ago.

We also sadly report the death of *Edmund Woodbury*, 1445 North State Parkway, Chicago, Illinois, 60610, on September 22, 1968.

As we reread the above notes we realize that we forgot to mention that your secretary is retiring from this job as of this date. He is very happy to report that *Walter Smith* has graciously consented to carry on as secretary and will do the class notes for October. Walter is retiring from the Arthur D. Little Company, Cambridge, on September 1 of this year, after 45 years of conscientious service. Many of you will remember that we took over from Walter as secretary six years ago. Please flood Walter with correspondence at his home, 209 Waverly Street, Arlington, Mass. 02174.—*Herman S. Swartz*, Construction Publishing Company, Inc., 27 Muzzey St., Lexington, Mass. 02173

29

Very little news to report for this July/August issue since the deadline comes just prior to the reunion festivities and Class Day. A nice "memo for the class secretary" was received from Colonel *Maurice E. Barker*, U.S.A. retired, of Fayetteville, Ark., which we quote as follows: "I was an Army student at M.I.T. from 1927 to 1930 in chemical engineering, M.S. in 1929, Sc.D. in 1930. Back to duty in the Chemical Corps U.S. Army at Edgewood as Chief, Research Division. Then a tour in the field as a soldier. Back to Washington as Chief, Technical Division, then overseas to Africa, Italy, and Okinawa and then to Chem School as Commandant until I retired in 1948. Then to University of Arkansas as Professor

and Head, Chemical Engineering Department, until I retired at 68. A score of technical papers and about a hundred outdoor articles and one novel along the way, as well as some twenty patents on ordnance items and charcoal activation. Best wishes for the anniversary." Thanks, Maurice, for the up-to-date resume.

A newsclipping on *Sidney Darlington* of Gillette, N.J., sheds light on his accomplishments. Sidney has been with Bell Telephone Laboratories, Inc., Murray Hill, N.J., since 1929 where he has been engaged in research in applied mathematics, with emphasis on network theory and military and space electronics. His patents in these fields number thirty or more and Dr. Darlington is an associate fellow of the American Institute of Aeronautics and Astronautics. His editorial on "What, if Any, are the Important Unsolved Questions Facing Filter Theorists Today?" can be found in the December 1968 issue of the *IEEE Transactions Circuit Theory*. Hope you all have a pleasant summer.—*John P. Rich*, Secretary, P.O. Box 503, Nashua, N.H. 03060

30

You will recall that as of the time the notes were written for the March issue it was uncertain whether the 40th reunion would be held at the Chatham Bars Inn or the Wianno Club. It now appears that we have a confirmed reservation at the Wianno Club. The exact reunion dates will be reported, together with further details, in future issues.

Designs hypobaric chambers

One of the reasons that I list my office address at the end of these columns is that the office is centrally located in Manhattan, and it seemed to me that perhaps out-of-town classmates coming to New York might be able to squeeze enough time from their usually busy schedules for a brief visit with me. Although such visits have not been frequent, I am happy to report that *Sig Linderth* stopped in last week and we had a pleasant chat. As previously reported in the notes, Sig is Professor of Mechanical Engineering at Duke and works on some very interesting research and consulting projects. He was in town to attend the A.S.M.E. Design Engineering Conference at the Waldorf-Astoria at which he was scheduled to deliver a paper on the design of hypobaric chambers for therapeutic and surgical applications. In respect to therapy, it appears that elevated pressures are useful in combating certain types of infections. The chambers designed for surgery have the advantage that they can be used to increase the oxygen content of the patient's blood in certain relatively complex operations such as open heart surgery. Sig is also involved in the design of chambers for deep sea use. He and Doris are planning to make an extended visit this summer to their younger daughter Marilyn, who lives near Boulder, Colo.

As previously reported in the notes, *Ralph Rowzee* is President and Manag-

ing Director of Polymer Corporation, Ltd., of Sarnia, Ont., which is a producer and distributor of synthetic rubber and plastics with producing plants in Canada, Belgium, France, Mexico, and South Africa and an independent distributor network in some 65 countries. Since the last report Ralph has taken on a number of new responsibilities including: President of the Society of the Chemical Industry; Board of Directors, Canadian Chemical Producer's Assoc., and member of the Science Council of Canada, the Advisory Board of St. Joseph's Hospital in Sarnia, and the Advisory Committee of the Business School at the University of Western Ontario. He says that he sees *Jack Bennett* and *Ted Riehl* at Goodyear in Akron at least once a year and occasionally sees *Phil Holt*.

We have at hand a report from *Morris Shaffer* bringing us up to date on his recent activities. You will recall that he is Chairman of the Department of Microbiology and Immunology at Tulane Medical School. His son Alexander graduated from Washington University in St. Louis and is now a freshman medical student at Tulane. Morris, his wife and daughter Charlotte (who for a brief period several years ago held the title of youngest child of a member of the class) spent seven weeks traveling in Europe last summer, including two weeks in Greece and the Aegean islands, a week in Yugoslavia visiting International Fellows of the U. S. National Institutes of Health, and a pleasant and relaxing return trip on the *Rotterdam*. This spring he is making a South American trip during which he will visit former N.I.H. Fellows in Caracas, Rio, Montevideo, Buenos Aires and Santiago. About a year ago, in the course of a trip to Boston, he saw *Sidney Kaye*, *Milton Mezoff* and *Saul Sigel* who all "seemed very happy with their lives and families." Morris presently plans to attend the 40th. . . . Changes of address: *Charles M. Twelves, Jr.*, Apt. 1, 1317 Ptarmigan Dr., Walnut Creek, Calif. 94595.—*Gordon K. Lister*, Secretary, 530 Fifth Ave., New York City, N.Y. 10036

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Last Lap, folks, until fall, or an interim letter whichever comes first. We broke off for the June issue just as we were to take off for Saint Louis, for the Mid-West M.I.T. Conference, run by the Class of 1933, in the person of *Ellis Littmann*. Knowing classmates, all over, it occurred to me that Ellis might be happy to know that one of his own mates would attend, so I did just that. A finer conference cannot be imagined, well run, by an Alumni Committee who, obviously, knew what it was doing. That always helps. This fine event will be reported elsewhere, and in detail, and before you read this column, so we can save repetition. The first event was the cocktail party, and dinner, at the home of Ros and Ellis Littmann; a party of about 75 people. With no Leona with me the girls went out of their way to make me feel at home.



J. Dyer Potter, Jr., '33 and his wife, Petey, in Hawaii

Please allow a digression; the Littmann home is really a marvelous place; large roomy, well and tastefully decorated, and located up quite high in the Country Estates Section. My personal committee was Wesley Wedemeyer, Class of 1930, who acted as Chauffeur, and President Cecil Green of the M.I.T. Alumni Association, assisted in getting me to the festivities, and, with that caliber of assistance, I got there, and got home (to the hotel). Wes was joined by his lovely after we got to the Country Estate, and she went with us when I was returned to the Chase. Quite obviously, we write this paragraph with mixed feelings. Not one other classmate showed up, and only *Slick Henderson* had a reasonable excuse, and we were unhappy not to have seen Slick and his lovely girl. I missed several more, but, with the knowledge that they could have made it, not as much. The rest of the mixed feelings item is that Ellis has now shown us that he can run anything, and please note that Ellis is the 40th Reunion Fund Chairman. We will all be hearing from Ellis.

Now, to make the last come along almost first, the above committee, 40th Fund, met in Cambridge at noon, April 28, 1969 for lunch, and an all afternoon meeting. Actually, it was not a committee meeting, as the Committee has not yet been selected. It was really a Class Officers meeting, and much spade work was done in preparing for the work of the committee, later, and, for preparing to select the Fund committee membership. *Jim Turner*, as Class President, and, *Ellis Littmann*, ran the meeting sort of informally, with the remainder of the group as follows: *Bob White*, Class Agent; *Westy Westaway*, and *George Henning*, Vice Presidents; *Warren Henderson*, Secretary; and *Ken Brock* from the M.I.T. Alumni Fund. Outside of general planning, we spent most of the afternoon examining the class roll, by individuals, with *Ken Brock* furnishing the card file. It was remarkable that the group as listed above, knew a very great majority of our 800 odd classmates. Some were well known to many, and a few were known only to one of us. Very, very few were completely unknown. It was noted that with members of the Courses II, VI, and XV, we had a coverage, there,

of almost half the class. To repeat, and stress, your class 40th Fund is in the right hands, Ellis and his (to be appointed) committee. We probably won't turn out to be champions, but we are determined to, and will, make a better than average showing.

Ere we leave the Faculty Club, we visited with *LeBurton Webster*, briefly, and it is always nice to visit with Burt, especially, as he came equipped with a photo of himself, previously requested, to be included with all other 35th reunion photos, come the 40th. Now, speaking of photos, I wrote *Joe Carbonell*, Greenville (Wilmington) Delaware, and asked him for his photo, and, suggested that he include the Carbonell story with the photo. So, Joe came through with the story, and said that the photo would follow, but, he did not say when. Gee, I will break myself sending post cards to these characters. Joe wrote me in his own handwriting, as he is, or was, confined to the house with a severe cold, and a recurrence of that ileitis (Eisenhower thing). I must make a quote, "You will not have known it, but I was operated on for it in 1963 and 1964." No, Joe, not being a mind reader, I surely would not know it, and, you know why? Because you neglected to tell me, as so many have not done before. One Son, Joe III, will graduate this June from the University of Virginia, School of something or other, and Joe III may go back for further study, or may not, which seems to cover all contingencies. Young Joe is married and has one daughter, as of January 3. This gets Joe, Sr., into the Grandfather's Club right off.

Joe goes on to say that he and Virginia enjoyed the 35th at Chatham Bars Inn very much indeed, but was disappointed in not seeing more of his Architectural pals. Well, Joe, so were we, though it seems more natural not to hear from architects than from others, as, Course IV was a sort of separate unit in them days, no? However, I did know a few architects, and know many more now (see top of this column). Joe, your suggestion of getting separate news on the architects must, in this case fall on unfertile ground. When *George Henning* was Class Secretary, probably

in 1933 or 1934, he tried to start a system of Course Secretaries with less than indifferent success. George says that he heard from only one, or perhaps two, of those 15 or 16 that he had appointed, and only one even acknowledged having been asked. This is, and was, partially hearsay, but the idea did not catch on. My personal view is that we are a class out of M.I.T. and are recognized as such. The Secretary is, and has been, willing to do anything for the class for which he finds time, but, he is unwilling to spend any time assembling news from any one group, especially one that is seldom heard from. Not hearing from so many, in all courses, is deplorable. Joe, you talk with your group, if such it is, get any and all news, send it in to me, and I will see that you get full and complete coverage. But, I just do not have time enough to make much more of a news gathering effort.

Now comes the best part, and I quote, "Virginia sends her best, and we both hope that you can find time to stop in at Wilmington on one of the trips north, or south." Thanks a million, Joe, but, we have driven that long haul for the last time, as my lovely Leona has decided that it is time she does some flying for a change. She has done some already, but has not had much experience with the jets, so we start flying North May 14; ship the automobile; put the dog in the baggage compartment, and we will put on the dog in the front of the aircraft. Which reminds me, I make a motion that mini skirts be disallowed in public positions where bending over is unavoidable. Again, thanks, Joe, for the nice note, but please send along the photo.

Cal Mohr comes through with a note about *Gerald V. O'Connor*, long missing, who now turns up as Director of Development and Planning, Monsanto Biondoze Systems Inc., College Point, N.Y. We knew that he was with Monsanto, but not where. It appears that Gerald took in the PetroChemical Show at New Orleans, as did Cal, hence the good news. Gerald says that he was formerly with another division of Monsanto, and actually gave a lecture on fertilizers to a class of Professor Sherwood's at M.I.T. The Biondoze business is about

like this; "The equipment bio-oxidizes the waste materials from industry [all industry?], and in these days of the almost hysterical water pollution movement, this equipment might well be a real financial success." Cal goes on to discover that *Winfield Partridge, Jr.*, has not moved to Mississippi, as previously reported, but is in Texas City as Cal has a reply to a letter written to Bay St. Louis, but got a reply from Texas City; very interesting but not much news in this item. Cal also reports, briefly, on Charlie Payne, who, says Cal, has been very successful with Eastman Kodak, presently Superintendent of the Paper Mill at Rochester. Folks, just let your imagination loose for a few seconds and ponder on the size and scope of the papermaking at Eastman, Rochester, N.Y. and probably elsewhere. Charlie has been very active in the Rochester M.I.T. Club work and is a past president. Note: these comments are terse, and taken from a copy of a letter to Jim Turner, on 40th Reunion Fund work. I get in on the backwash, and this bit of brief comment is not Cal's usual style. Thanks a whole lot, Cal, and I will write to O'Connor asking for personal info and perhaps, prices, which appear to be his top interest.

Further from Cal, this one direct, is a small bunch of news paper clippings on many subjects, mostly personal in nature. But his short letter mentions one clip; Mrs. Margaret Seyl, wife of our own *Bob Seyl*. Cal says that he has not heard from Bob in several years (Haw, who has?), but did notice the attached clip about Mrs. Seyl, who was recently elected president of the Evanston Community Consolidated School Board, District 65. Mrs. Seyl was President Pro Tem last year. She is, and was, very much interested in school work of this nature. So, we get the chance of congratulating the wife of a classmate on her being honored by peers in this late election. Bob, you could relent and send in some personal stuff. I ask, though I vowed I never would when I received your last communication five years ago.

It is always a real and thrilling pleasure to receive a card from *Vivian Drenckhahn*, whose masters from Course VII makes her a classmate. She is now teaching, half-time, at the Health Care Center of the University of Minnesota. Vivian retired(?) last year, so she acts like the mailman taking a walk on his day off. She has been teaching at this spot since returning from New Delhi, where she spent four months on an assignment from W.H.O.(?), and she allows that she was very glad to go back to New Delhi after ten years absence. As a promising finale, Vivian says that she has every hope of attending a 1933 class reunion. Viv, me gal, if you can't make the class reunion, why not honor us all by signing up for the 1969 Alumni Day, applications for which you will be receiving any day now. I will see that you meet a lot of

nice folks, not necessarily of 1933, and there are many. I know that you would enjoy the day, as it is not tiring, and certainly not for the vigorous you. Alumni Day is annual, and one gets to see many friends, year after year, not always of one's own class, as why should they be? I write this as though Vivian would read it tomorrow, so, obviously, I must drop her a line right off, if she is to consider the visit to Cambridge come June. Vivian, I do appreciate getting your nice card, as you are the only classmate from whom I hear with any regularity, distaff wise.

I have a short one from vice one *Charlie Bell*, of Rhode Island. I have been pestering Charlie about a photo, so he sends one, for sure. Not much more news, sez Charlie, as "I sent in a lot a month or so ago." Maybe, but I don't count those old ones. We always start fresh, every issue. Thanks for the photo, Charlie, and don't forget us. Another short one, this from *Norm Levinson*, Head of the math department, M.I.T. Norm gives no information about himself or family, so I have written him asking for all I can get. Norm's letter was an inquiry about the passing of Walter Oppen, which was mentioned in the April issue. With this short reminder, Norm will make up a personal biography for us, alone.

Well, Sir, here is some proof that the surest way of hearing from anyone is to write a few mistakes. *Horace MacKechnie* writes that I got the Macs confused in the March Review. You will recall that the MacKechnies got out a Christmas letter, sent me a copy, for use in the Review, if and when. As I have explained before, these letters at the holiday season are written to the families and close friends of the writers, and, it is only natural that first names are the order of the day. Nana usually means one of the grandmothers; everyone knows Aunt Emma, and so on, etc. So, I got mixed up, and am now in the process of admitting my shortcomings; Prue, it seems, is Horace's wife, and the Macs have two daughters; the elder is Margaret, married with three children, and Joan, the younger, is to graduate this June from the University of Virginia School of Nursing, at which time she is awarded the B.S. and the R.N. She is on the Dean's List, not at all like her father while he was at M.I.T. On the contrary, as I see it, our Dean's list was short and was made up of those who were on their way out, so that not being on the Dean's List is not exactly the same as in other schools. Horace, it seems, has been active in the Alexandria, Va., area working on the M.I.T. Alumni Fund; a very admirable endeavor. But, Horace, the 1933 40th Reunion Fund is on the make right now, and you may be called upon to do an especially good job for the Institute and your Class. Classmates are usually urged to make an annual contribution to the Fund for five consecutive years, as all funds are allotted to the Class, over a five year period. Well, Horace,

you are one of the few who have stopped at the farm during any summer, so you and Prue, and family, are especially welcome to drop in on us. Always, of course, to save time, call first; 772-2333 or 772-3146. And, many, many thanks for the correction. I will now always, or almost always, remember that Prue is married to Horace, so there.

I believe that I mentioned that I had had lunch with *Don Fink*, *Newland Smith*, and *Werner Bachli* at the New York City Chemists' Club. It was agreed that each would send me a short biographical sketch on himself and family. With some urging, to make understood that I meant it, I have a reply from Don and Newland, but not Werner. In all fairness, I must mention that Werner may be on the move to Phoenix, with an imminent job change, still with G.E. of course. Don starts off with: "Wife Sally is a terrible golfer, having made two holes in three strokes." Haw!! But, sezee, it was only to keep me humble. I will allow all and sundry to imagine what humble means to Don. The eldest, daughter Kathy is a sophomore at Wellesley, then son Steve will enter Brown next fall, and the youngest, daughter Sue is a high school sophomore.

Don and Sally both went to Moscow and Novosibirsk a year ago, on I.E.E.E. business, of course. I had sort of figured on a Moscow story, but Don passed over that with ease. Don later went on to Tolio, solo, and is now back in the grind. We mentioned, last time out, that Don, as Editor-in-Chief, has just finished the 10th Edition of the *Standard Handbook for Electrical Engineers*, and mentions that there were 116 contributing authors. Now he says that he is just starting a similar handbook for Electronics Engineers. "This is all strictly extra curricular, on top of keeping 163,000 I.E.E.E. members happy. I enjoyed the launch, and, let's do that more often." With that kind of company, I sure would enjoy. Many thanks, Don, and won't you be a little more specific about Moscow? For later use, I mean!

Newland Smith comes through admirably with a family story well worth perusing. He is still happily married to the former Caroline Crosby, and that has meant two sons; Newland III, and Lawrence. N. F. S. 3rd is Librarian of the Seabury Theological School in Evanston, after graduating from Hamilton and the University of Chicago Library School. He is married and has one child, Arthur, aged two years, which gets Newland into the club. Lawrence is a graduate of Bowdoin, has had two years in the Army in Germany, and has since taken an M.B.A. from Columbia University. At present he is Security Analyst with Payne, Weber, Jackson and Curtis. Newland left Gray Mfg. Co., seven years ago, and has gone into consulting and his own kind of inventing in electronics. The inventing is Data Systems, and the consulting is both private and with CBS-TV, and, for the last three years, he has been Assistant to the President of Visual Electronics

Corporation, New York City, and, he finds this work both lucrative and intriguing as it involves management, marketing, and engineering. The Smiths enjoy their New Canaan, Conn., home except for the rugged commuting to and from New York City. They have a summer home in Heath, Mass., in the Berkshires. As an added thought, Don Fink's Russian trip seems to have impressed Newland and Caroline, as they intend, probably in the fall, to take the same trip, as a vacation, then follow that by visiting the Greek islands, and the Yugoslavian coast. I sort of envy the Smiths this Greek island trip, as I have yet to see that part of the world, though I have cruised the long coast of Yugoslavia, at once all three; beautiful, rugged, and forbidding. Though there are quite a few resorts along the Yugoslave coast, the coast itself is sparsely settled. Newland, my very best to Caroline, and certainly my best wishes for a fine trip as described above. Just don't forget to tell the secretary about it when you get back. It seems that you did give me quite a story the last time, so I have hopes again. If one can't do all the travelling, then this kind is a fine substitute, reading and telling about it. So, our most sincere thanks for your good letter. We appreciate it very much, as will all your classmates.

Now comes one of our famed firsts, the first missive ever from a classmate, *Norm Lievinson*, Head, Department of Mathematics, M.I.T. We did a piece on Professor Norman a year or so ago when he was made top man in his department, but, the story was paraphrased from a press clip. Here we have him almost in the flesh. He wrote me a month or so ago asking more details about a good friend and classmate Walt Oppen, recently deceased. I had no such detail but gave him an address where he could write should he so wish. I also told him that this service is not free, but neither is it costly. "Just write me a short biography, and some good news about the family, and all is forgiven." He did, and I have it, and thanks, Norm. Norm took all three of his degrees from M.I.T. But this does not mean that he got his entire education there (or here). He was appointed, in 1948, to the John Simon Guggenheim Fellowship, and in 1953 was awarded the Bocher Prize of the Mathematical Society for his work on differential equations. As early as 1934-5, he was made a Redfield Proctor Fellow (Travelling) and studied at Cambridge University for most of those two years. Later, 1935-1937, he was a National Research Council Fellow at Princeton's Institute for Advanced Study. Professor Einstein was on the faculty at that time (I hear). During W.W. II, Norm was a Research Mathematician, and Technical representative in the Applied Mathematics Group of NDRC(?), where the purpose was theoretical and experimental investigation of underwater ballistics. In Goodridge, we find, further, that Norm spent a year at the University of Copenhagen, but no details on this one. The Levinsons were blessed with two children, both girls,

now 29 and 27, respectively, and both graduates of Boston University in 1962. Sylvia C. Married Dr. Michael Remler, Neurologist at Boston City Hospital, and Joan E. married Thomas Sherman, '61, Associate Professor at Northeastern University. Though it matters little to our readers, we are unable to give proper credit for the distribution of the grandchildren, or perhaps I should say, bluntly, the sex of the same. So, the Shermans have two children, Derin and Arloc; and the Remlers have two more, Dahlia and Ilan. So, I find myself indentifying Dahlia as a girl, though this is not 100 per cent certain, and the other three are indeterminate. Ain't this all just like the absent minded professor? I don't recall Norm being absent minded; just remote minded. It seems to me that he had a great head of bushy hair, and were he to attend a reunion once in a while, we could find out if he still has any of it. Norm, we thank you no end for your kind letter, with such a complete set of facts. If you should hear, or receive more on Walt Oppen, I sure would appreciate getting it. I hesitate to write asking for gossip from widows, but, he was your personal friend, and you just might pick up some news of interest, without stirring up too many sad memories.

The change of address situation is, apparently, stabilized, with only three changes this time around. They come through as follows; *Gerard M. Kincade*, MG; *Kenneth D. Moslander*, MG; and *William Niessen*, CE. We appear to have lost track of John Glenn, though this is not so. He just doesn't leave his home address where one may find it easily. However, we now have it, and will use it to stir things up, later. I am not used to finding two classmates, at the same business address, going into retirement on the same day. These two were *John Glenn*, and *Ken Moslander*. Now, we find that Ken has moved to Chagrin Falls, Ohio, a twenty mile suburb of Cleveland, Ohio. We have written Ken, with no reply yet. Bill Niessen, apparently, is a hot and cold type. He has a summer address in St. Paul, and a winter location on Marco Island, mentioned heretofore in these pages. These addresses are on tap, awaiting those who might make inquiry.

All things come to him who is inclined to wait. Now come the press clips, etc., etc., after a painful absence of a month or so, and welcome indeed. It appears that the record 1933 news for May has not affected the remaining issues, though I had feared that I might run out of copy too soon this time. The irrepressible *Robert H. (Bob) Winters* hits the top line again, this time he takes on additional work so as to keep both hands busy, but being elected to the Board of Kaiser Resources, Ltd., a subsidiary (formerly known as Kaiser Coal, Ltd), now known as above, and in turn 59 per cent owned by Kaiser Industries Corp., no details. Take it easy, Bob, as good men like you and I are getting scarce. Good luck to you and the lovely Eleanor. We are in residence in the Garden Spot, Exeter, so come see us. *Ralph Hayden*, President of

the Foxboro Company sends out a press release, in the form of a brief Profit and Loss item which gets his name in the news, but he sends me nary a word, to a point where I do believe that I should ask him for news of a personal nature. I will do that by mail, so that some embarrassment will be avoided. Anyway, the first quarter was not quite as good as the same quarter last year. Extra, "Less Air-Traffic Congestion Seen." *John Wiley* spent a half hour on Sunday March 30 answering questions on New York Radio station WHN, Subject: "New York Speaks out." The Port of New York Aviation Director, John Wiley, appears to have been the only one answering the questions, so we are assured of uniform coverage. The long delays in air traffic, in and out of New York's three airports, and possible cure, direct, or indirect, was canvassed most efficiently (writer's observation; the situation has been relieved, but not cured, as yet) Wiley, in the interview pulled no punches when he said exactly this. John hopes that the ultimate effect on congestion will be materially relieved by the increase of landing fees to General Aviation Aircraft. his general aviation is called a loose term that covers all the planes using the port, outside of scheduled airlines, and the Armed Forces. The immediate effect of raising landing fees was, or is, an approximate reduction in such traffic of about 31%. This reduction has resulted in more slots now available to the rest of the airline equipment, coming and going. To continue to paraphrase John, another thing done already has been to plan and get ready the "Quota System," published by the F.A.A., which will go into effect June 1, 1969. It is hoped this will further help in eliminating the congestion by limiting the number of landings and take offs, by Federal order, not only as to total number but also between airlines, and other types of users. This will again produce more slots at the end of the runways. Still more is expected from assigning air taxi companies to short take off and landing runways, commonly not used by airlines at the major airports. One questioner remarked that it is obvious that by curtailing service to the public, and by discouraging general aviation planes from using the runways, is certainly not going to make the public any the happier when it is asked to curtail its use of the air. John agreed, but had to add that the Authority had been trying to cure the disease with increasing congestion, for 10 years, so that now they are forced to treat the symptoms. It now turns out that the disease is also being studied, and the only sure cure is another, larger, and better airport for use by the airlines in and out of greater New York. It seems the New York Legislature has already approved a site in Northwest New Jersey, and that the New Jersey Legislature is presently considering the matter. The site is near the town of Solberg. This discussion, via the question method, went on for the rest of the half hour, and involved many diversions, including the economic effect on New York City. With the use rate at Kennedy showing much less gain in

traffic than the national average, the effect of travelers seeking cities other than New York is very evident; this is more than evident in the overseas traffic which is bypassing New York more and more. The writer has a suggestion to make to those who might be interested in this vital subject. This 24 page, double spaced release was made on March 30, 1969, and copies may be had, without much doubt from Station WHN, New York. We just cannot begin to do more than excite interest in this vital situation, and to show that our classmate, John Wiley, is right smack in the middle, and John is really concerned. If WHN does not see fit to send anyone a release, then write me, and I will circulate the release from here. I wish further to mention what a fine job this fellow Wiley is doing. Keep it up. I expect that I will be phoning you before fall, for some material for the September interim letter. Strayed, but obviously not lost, is our own *Donald H. Newhall* who writes that he gets news through classes 1933, and 1934 (Michigan). Don was our boy when he dropped out in 1932, and he had his own reasons for so doing. Don now Heads Harwood Engineering, Inc., of Walpole, Mass. He is still our friend, and we wish him well as he took time to drop us a line. He married his Priscilla in 1937, and they had two sons. Priscilla passed away in 1966, and presumably Don is still unattached. His two sons have given him three grandchildren, which makes the club with ease. He is still active in the Alumni work of his M.I.T. Fraternity (can't make it out), and, he adds, hastily, "served 7 years in the U.S. Army during (?) W.W. II." Thanks, Don; it was a real pleasure to hear from you and I know that others in our Course II will be glad to hear from you. Why not try to make some Alumni Days later? That Day is a dandy, and I would not miss it for the world. I know that you would find friends.

That concludes the work for the year, and, although I love it, I am pleased for a respite, until I start on the interim letter. This one goes via the mails to all 1933 men whoever were, and not just to those who receive the *Review*. If anyone reading this wants to send a message to any of our absent brethren, just send it to me and I will include it. This service is gratis, and costs nothing more a half page of personal news of the family. Until November 15, see address below, and if close by, use the phone, 772-2333, Monday to Friday; Rye Beach, 964-8034, Friday to Monday; anytime, the foreman's house, 772-3146. By the way, who was the classmate that was rebuilding an old mill in Hampton as a summer home? Won't you please get in touch with me? I have lost the address. Hasta la vista—*Warren J. Henderson*, Fort Rock Farm, Drawer H, Exeter, N.H. 03833

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This month's mail bag contained a number of diverse items. From *Allan Mowatt*,

"On my recent West Coast trip, I spent several nights with first Edith and *Ham Dow* in San Jose and then Verna and *Gerry Rich* 30 miles away in Santa Cruz. The Dows are living in a newly developed area, 'The Villages,' which has its own golf course that we played twice. The Rich's home is on the 13th fairway at Pasatiempo Golf Course. Gerry is in the second year of building his own company (Rich Laboratories) with its first product being an emergency power supply for use on CATV systems.

"Two days after returning from that trip of three weeks, I was taken to the hospital with what was thought to be a heart attack. But I was lucky, and the illness had developed from tenseness and exhaustion. I am treating it as a warning and trying to slow down.

"Mrs. *Burtis Brown*, whose late husband was in our class, reports from Florida that *John E. Kiker, Jr.* lost his wife last October in a tragic accident. That, coupled with complete mental and physical exhaustion from his intense research work at the University of Florida, has put him in the hospital. His address for those who would like to write to him is VA Hospital, Tuscaloosa, Alabama 35401."

While signing up 35'ers for the ninth annual class golf tournament, Allan received a note from *Samuel P. Brown*, which read, "Yes, last year I became very busy; postponed vacation, worked many Saturdays, and played little (and very poor) golf. We took the vacation this spring; just returned from Morocco, our Easter in Rome, then Greek Orthodox Easter in Athens, two days visiting the islands of Delos, Mykanos and Hydra, and finally two days in Paris." *Edgar J. Staff* sent a post card from Catalina Island saying, "Here for two or three months on this semi-tropical island. Staying with my nephew, Robert Staff, M.I.T. '41, who is still the only doctor here for 1,600 people in winter and 25,000 in summer.

From *Morton J. Weinberg*, "Not much to astound anyone, I am a plodder, spent 25 years as an aeronautical engineer. Lately have been involved with ground transportation (The Urban Crisis). Married for 28 years, same wife (Sue Ann Snyder). Three children, oldest is 26 and married (master's degree from Cornell University). Second is in the Army (bachelor's degree from Syracuse). The youngest is coming up 21 and is a senior at Harpur College, linguistics. I am still more expert as a craftsman than most, still maintain an active flying career. Still weigh the same as I did when I graduated from M.I.T. Now in the research laboratory at Cornell Aeronautical Laboratory in Buffalo."

From *George C. Morrisette*, "Now employed as a manufacturing engineer by the General Electric Company at Appliance Park in Louisville, Ky." . . . *Joseph S. Oldham* is now a Supervisor with 30 years' service in the U.S. Post Office and is a retired Major from the U.S. Army Reserve.—Co-Secretaries: *Phoenix N.*

Dangel, 329 Park St., West Roxbury, Mass. 02132; *Irving S. Banquer*, 20 Gordon Road, Waban, Mass. 02168

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When you read this Alumni Day will have come and gone and I hope that I will have seen many of you there. . . . Last month I regretfully reported the untimely death of *Morgan Rullon* last December. A note from his wife, Nancy, indicates that he was a very busy man. Morgan was Vice President of Robert E. Lamb, Inc., of Valley Forge. He was also Vice President of Valley Forge Industrial Park and on the Board of Philadelphia Steel and Wire. His extra curricular activities included the Board of Horizon House in Philadelphia and the Radner Township School Authority. He was a former Vice President of the School Board and a past Warden and Vestryman of St. Mary's Church in Wayne. I am sure that his going has been keenly felt by his business associates and the community, and most of all by his wife, daughter Judy and son Peter, who survive him. Morgan lived at 510 Meadow Brook Circle, Saint Davids, Pa., 19087.

Union Carbide has moved *John P. Hamilton* to Charleston, W. Va. (P.O. Box 2831, 25330). . . . *Roger Krey* reports along with his Alumni Fund contribution: "In 1955 I was cast by chance into the science of joining ceramic to metal in R.C.A.'s tube division. I developed processes and designed ceramic-metal enclosures for electron tubes, lamps, and thermo-electric devices. Product and policy changes ended all this in 1964. Small companies failed to provide encouragement for my bent for original development, and so in 1967 I left engineering to live full-time at my old home in New Hampshire. Present avocation is land investment for timber and recreational uses." The place is Mirror Lake.

And now a personal note from your Secretary. I have sold my house in Winchester and at the time of writing this I am uncertain as to my new address in the Boston area so I herewith give you an address which will remain in effect for some time to come. Mail will always be forwarded to me.—*Alice H. Kimball, Secretary*, P.O. Box 31, West Hartland, Conn. 06091

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Arthur Ross is now Secretary-Treasurer of Michael Hayman and Co., Inc. He is also a member of the Buffalo Yacht Club and public relations officer of the Buffalo Power Squadron. His address is 207 S. Cayuga Road, Williamsville, N.Y. 14221. Arthur would like the address of John Sawyer, which is not in my files. Some member of our class may be able to supply this address to Arthur. . . . Just received an announcement of the marriage of *Gray Jensvold* to Elizabeth Russell.

Following this I heard from *Phil Dreis-*



Albert O. Wilson, Jr., '38, a Director of the American Institute of Steel Construction, had the pleasure this spring of presenting the Institute's 1968 Architectural Award of Excellence to O. Stuart Chase (right) of Eaglebrook School, Deerfield, Mass. The School's award was for its C. Thurston Chase Learning Center completed last year.

sigacker who writes that he has "just finished a delightfully active winter. Can't remember when the skiing was as good. We spent Easter weekend at Stowe with family and friends. Ruth and I dropped in on Gray Jensvold in Morrisville and met his new wife "Lib" and learned of their family, 10 kids, five each and all grown up. My two are also grown—Dick out of Brown this year, Pete into Stamford in the fall." . . . Also heard from *Phil Peters*, that he finally helped close Wildcat down the previous weekend after idyllic skiing this past winter on the Eastern slope.

Bernhard Schondorff, Erkelenz, West Germany, has established a subsidiary corporation of his company Wilhelm Hegenscheidt, in Oak Park, Mich., which is building deep rolling machines now being used by both Oldsmobile and Pontiac. The above machines were recently the subject of a front page article of the *Metalworking News*. Best wishes for a pleasant summer and keep sending the news.—*Robert H. Thorson*, Secretary, 506 Riverside Ave., Medford, Mass. 02155; Professor *Curtiss Powell*, Assistant Secretary Room 5-325, M.I.T. Cambridge, Mass. 02142; *Jerome Salny*, Assistant Secretary *Egbert Hill*, Morristown, N.J.

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Wilbur Rice writes as follows: "Went moose hunting in Sweden last fall and found it most interesting. Shot four and that is enough moose for a long time. Hope to try Alaska some day—possibly a bear! Am proud of M.I.T.—no riots, etc.—a good student body and a competent administration."

I could not resist filling up the space left vacant by you who did not bother to drop me a line with a picture of our most handsome classmate, *Al Wilson*, who presented, on behalf of the American Institute of Steel Construction, a plaque to O. Stuart Chase, of Eaglebrook School, said school having an Architectural Award winner. I promised free advertising. If you don't already know it, Al is President of A. O. Wilson Structural Steel Company in Cambridge and is a Director of the American Institute of Steel Construction.

Don Severance wrote a brief report saying: "Saturday, April 12, I attended the M.I.T. Mid-west Regional Conference in St. Louis. The evening before there was a dinner party for the guest speakers from Cambridge, and other camp followers. To my surprise and pleasure the member of the local committee who picked me up at the hotel that evening was *Jim Maguire* of Monsanto who was in charge of public relations for the conference. Other '38 fellows whom I had the chance to see were *Harry Saunders* who came down from Chicago and *Dave Wright*."

Don and Phil Severance also ran into *Cliff Nelson* and wife Jane at an M.I.T. Club of Portland, Maine, meeting. By now the Nelsons are enroute to Australia, where Cliff will enjoy a year's sabbatical leave.—*A. L. Bruneau*, Secretary, Hurdman & Cranstoun, Penney & Co., 140 Broadway, New York, N.Y. 10005

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Richard L. Steiner, Course IV-B, jotted a note that he is now an Urban Consultant in Baltimore and is teaching part-time at Howard University in Washington as Professor of City Planning. . . . *Millard M. Brenner*, Course VI, has been named Assistant to the President, Corporate Development, for General Atronics Corporation, a Magnavox Company subsidiary in Philadelphia. Millard's products are in the fields of library book theft detection, and optical scanners for product counting, sorting, and data acquisition in materials handling operations. He joined General Atronics in 1958.

George R. Mitchell, Course X, Chief Materials Research Engineer for The Glastic Corporation, Cleveland, was elected a Fellow of the American Institute of Chemists, in recognition of his professional contributions and service. He holds several patents involving polymer science in the electrical insulation field.

Peter M. Bernays, Course V, Senior Editor of *Chemical Abstracts*, located in Columbus, Ohio, represented M.I.T. at ceremonies at Kenyon College on April 15, 1969. . . . *Robert J. Tapscott*, Course XIII, Vice President and Chief Naval Architect of George G. Sharp, Inc., New

York City, has been appointed by the Maritime Transportation Research Board of the National Research Council to head a team of experts on ship safety. His group is to develop a comparison of U.S. safety regulations, performance, and costs with those of representative foreign countries.

Brigadier General *Leo A. Kiley*, Course X, Commander of the Office of Aerospace Research, U.S.A.F., will retire on July 31 after a 30-year career as a military scientist. He received his doctorate in nuclear chemistry from Ohio State University in 1952, and New Mexico State University conferred the honorary degree of Doctor of Laws on him in May, 1967. Leo's oldest son Michael recently earned his pilot's wings and was commissioned a lieutenant in the Air Force. The Kiley's married daughter Karen Lee Hardy lives in Santa Fe, N.M., and their youngest son Thomas Leo, lives at home in McLean, Virginia.

Harold J. Muckley, Course XIX, currently serves as president of the Pipe Line Contractors Association, as reported in *Pipeline Engineer*. Harold is president of Houston Contracting Company, headquartered in Houston, but he lives in New Orleans where he is operating and expanding the company's south Louisiana facilities. . . . *Irving Peskoe's* (Course IX-A) wife Bea sent along a fine clipping on their daughter Anne who had built a six-foot high model of DNA as part of her exhibit for the 15th Annual South Florida Science Fair. Bea wrote that they would be seeing '39ers at the 30th reunion.—*Oswald Stewart*, Secretary, 3395 Green Meadow Circle, Bethlehem, Pa. 18017

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For the second time in 19 years there was no '40 column. The reason was three-fold: no direct news from classmates, no information from the clipping service and, at the time the column was due, your secretary took a week's vacation for the first time in over a year.

Joseph C. Jefferds, Jr., president of Jefferds and Moore Industrial Equipment Co., member of the West Virginia State Board of Education for 9 years, received the honorary degree of doctor of science



G. R. Mitchell, '39



L. A. Kiley, '39

from West Virginia Tech on May 11. . . . **John Berges** is Manager of the Refrigerator Components Division of General Electric Appliance Park in Louisville, Ky. He has two married sons, a son in college, all of whom are engineers, a son in high school and two daughters in grade school and, at present, one grandson.

Bob Davis has been elected vice president of Hooker Chemical Corporation. Previously he was general manager, International Division. After joining Hooker in 1962, he was manager of operations for that division. Bob was with the Chemical Warfare Service in 1946 and then was with Colgate in 1953 and subsequently worked for Celanese and FMC before joining Hooker. . . . **Bob Lundgren** was elected vice president of Detroit Edison Co. . . . **Michael Biancardi** is the new director of the product safety division of Employers Insurance of Wausau and will be responsible for safety techniques and efforts. He brings a wealth of experience to his new job, 12 years as corporate safety manager for Allis-Chalmers.

Eldred Timson is on the Editorial Advisory Board for *Appliance Engineer*. Since graduating from Tech, Eldred has been with Sunbeam; he advanced to his present position as vice president of research and engineering during 1968. . . . **Charles Godfrey** is the author of an article on hypervelocity in *Industrial Research* for February 1969. The article is based on the recent development of explosives converting chemical energy into kinetic energy in a gas to produce extraordinarily high velocities. Charles, at present, is vice president and chief scientist of Physics International Co. . . . **Norm Scott** is now dean of the University of Michigan's Campus at Dearborn. He is chief executive officer for this branch campus and, undoubtedly, the job is a lively one in view of present trends. . . . **Eugene West** was remarried on April 19, 1969, to Vera Mae Robinson of Sarasota, Fla.

"Lion Corp on the roar again"

Louie Michelson made the news recently in an article in the *Boston Globe* titled "Lion Corp on the roar again." "Lion Research Corp. of Newton is beginning to roar again. It has recovered from a dis-

astrous fire in 1966 to a position where its president, Louis Michelson, talks of aiming at sales of more than \$20 million five years from now. It is an ambitious target for a company that in 1968 had sales of only \$417,992 and a net loss of more than \$165,000. But things are looking up. Problems of undercapitalization have been resolved. The product line has been broadened and now the company's marketing has been stepped up. Michelson's tenure is beginning to pay off.

"Michelson took over a company that—until the fire had had six profitable years, but had stayed small. Founded in 1959 by Professor Kurt S. Lion of M.I.T. and Dr. G. Frederick Vanderschmidt, two inventors, the company moved into instrumentation and data measurement. The company developed pressure transducers reflectometers and emissometers, carbon dioxide analyzers. But profits came mainly from research and development. Michelson's plan, now beginning to gel, was to take the company's products and commercialize them.

"One of the first such products was a dynamic electronic micrometer, a non-contact measuring device that can measure at high speed. Manufacturers of turbine rotors have adopted the instrument and it has proved successful in a variety of grinding and machining operations. . . . Potential uses include hookup with a computer in a closed loop system in numerical control machining 'The potential is enormous,' Michelson said, 'and we are just getting into it.'

"Another product with exciting possibilities is a sensor for jet looms that produce nylon cloth, but they badly need a device that will monitor the thin nylon thread as it is fired back and forth across the loom by a jet of water 400 or more times a minute. Tests are currently in progress with a leading loom manufacturer. . . . There are more products, just as exciting, some still under wraps. The problem is which ones to exploit first, Michelson said. To help establish priorities and hone the company's marketing capability, Lion sought the help of International Management and Marketing Group Inc.

"Michelson said last week that Lion has stopped losing money and that it should

post about \$750,000 in sales this year and hit \$2 million next year."—**Alvin Gutttag**, Secretary, Cushman, Darby & Cushman, American Security Bldg., 730 15th St., N.W., Washington, D.C. 20005

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The "Annual Get-together" of our classmates in the Boston area was held on Saturday evening, May 17, in Hopkinton, at the home of **Johan and Sis Andersen** who were assisted by their two pretty daughters in maintaining an ample flow of hors d'oeuvres and cocktails. A special treat for those present was a genuine New England clambake, including delicious clam chowder, steamed clams and lobsters with such extras as steamed corn on the cob, knackwurst, potatoes, coffee and watermelon. And that the Lord smiles on the Class of '41 was evidenced by the fact that all this was enjoyed on the front lawn under a sunny sky and the first 80 degree day of the year. Out of the many yarns told came a few truths, such as that **Ed Beaupre** will soon be a proud skipper of a 45' schooner now under construction in Nova Scotia and to be delivered to him in Newport, R.I. this summer. Also, **Earl Meyers** will commute this summer between Lake Winnepesaukee and his plant in Brockton in his two engine Astec airplane.

Among those present besides the Andersens were: **Earl and Margaret Meyers**, **Ed and Doris Pillsbury**, **Ed and Natalie Marden**, **Ed and Alice Beaupre**, **John and Margaret Sexton** and one of their daughters, **Ed and Leona Zarsky**, **George and Estelle Hite**, **Dave and Joanne Howard**, **Mitch and Marjorie Marcus**, **Franklyn and Mrs. Phillips**, **James and Edith Mar**, and **Walt Kreske**.

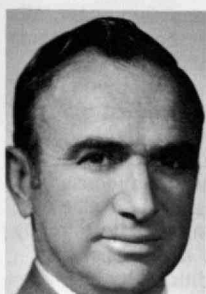
George W. Clark, manager of Lighting Equipment Design for Sylvania's Lighting Equipment Division, Danvers, Mass., has been elected to the national office of Treasurer of the Illuminating Engineering Society. He will take office October 1, 1969. The 10,500 member Illuminating Engineering Society is the recognized professional authority for approved lighting standards in the U.S. and Canada and is the only international professional group organized solely to serve the needs



R. J. Davis, '40



G. W. Clark, '41



J. T. Coe, '42

of the illuminating engineering profession. George joined Sylvania as a District Engineer in Washington, D.C. in 1948. He was appointed Manager of Marketing for Lighting Equipment in 1960, and was named to his present position in 1966. He is a Fellow of the Illuminating Engineering Society, a member of the Acoustical Society of America and the Construction Specification Institute.

Paul M. Heilman has been appointed product sales manager-forgings for Bridgeport Brass Company, a division of National Distillers and Chemical Corporation. Since 1964, Paul has been with the Cooper Development Association, incorporated as market development manager, seeking markets for copper and copper alloys in the industrial machinery and electrical industry areas. He is a member of the American Society for Metals, American Marketing Association and Institute of Electrical and Electronic Engineers. He resides on Ellery Lane in Westport, Conn., with his wife and two children.

Howard J. Samuels was featured speaker at the 54th International Purchasing Conference held in Minneapolis, Minn., May 18-21. Howard was formerly Administrator of the Small Business Administration under the Johnson administration.

Raymond B. Krieger, Jr., is the author of an article titled *Advances in the Corrosion Resistance of Bonded Structures* appearing in the February/March 1969 issue of the *Sampe Journal*. In this article he refers to two important advances in the corrosion resistance of bonded structures introduced in 1968. He says that the first of these improves the resistance of aluminum adherents through the use of newly developed adhesive primers, and the second advance improves the resistance of aluminum honeycomb core by subjecting the foil to a newly developed surface treatment as an integral step in the core manufacturing process. Raymond joined the Glenn L. Martin Co., in 1941 and in 1953 to 1956 he was with Luria-Cournand as Chief Engineer. From 1956 to the present he has been with American Cyanamid, Bloomingdale Department, first as Chief Engineer and then Sales Manager, now as Technical Manager.—**Walter J. Kreske**, Secretary,

53 State St., Boston, Mass. 02109; **Everett R. Ackerson**, Assistant Secretary, 831 Cranford Ave., Westfield, N. J. 07090; **Michael Driscoll**, Assistant Secretary, 63 Center St., Nantucket, Mass. 02554

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Bob Greenes, president of Public Fuel Service Inc., in New York City was elected president of the Empire State Petroleum and Fuel Merchants Association. . . . **Jerry Coe** has been named vice president and general manager of the Industry Components and Metallurgical Division of General Electric with headquarters in Detroit. Included in Jerry's division are the Metallurgical Products Department, the Specialty Materials Department, the General Purpose Motor Department and the Magnetic Materials Business Section. In addition to plants in the U.S., Jerry is responsible for operations in Milan and in Istanbul. We wish him the very best of continued success in his new assignment.

Floyd Lyon has agreed to serve as Estate Secretary for our Class. He will be working with Alumni Fund Headquarters on programs to interest all of us in providing estate contributions to the Institute. . . .

Al MacNee received the A.S.E.E. Western Electric Field Award for engineering student instruction. Design Homes Corporation has recently opened corporate offices at Atlanta and is building a manufacturing plant for mobile homes and for relocatable housing at Rome, Georgia. **Mortimer Reed**, formerly with U.S. Gypsum Company is vice president of Design Homes. . . . **American Metals Market** reports **Kenneth Davis** a member of Commerce Secretary Stans' "youth brigade." He was appointed Assistant Secretary of Commerce for domestic and international business which includes responsibility for the Business and Defense Services Administration and for the Bureau of International Commerce.

From the flaps of Alumni Fund contributions: **Bud Lacey** writes, "Joined G.E. at the Valley Forge Space Technology Center to provide some meteorological support to the NIMBUS Weather Satellite Programs." . . . **Frances (Ross) Karlan**

reports, "My son, Daniel, is graduating from Horace Mann School in June and will be entering M.I.T. as a freshman in September. My daughter Debbie is getting married on August 3 to Steve Black, now a senior at Harvard Law School."

From **E. S. Campbell**, "Have been in Stuttgart, Germany, for one year now and my family and I are enjoying Europe. Am presently on loan to Western Electric Company from New England Tel and Tel to head up their operations in Europe as government consultant on the European portion of a world-wide dial telephone system for the Department of Defense."

The final Alumni Fund envelope flap report is quite overwhelming from **Linwood Adams** as follows, "Am still designing transformers but have recently added some sales activity to the role of engineer. At present commuting between my office in Newtonville (Mass.) and the plant in Riverside, Calif., leaves little time for extracurricular activities. Two of our nine children are married and on their own, with the other seven in schools from grade two to college. Even our grandson will be attending nursery school this fall." I assume that the trans-continental commute is recent!

Walt Eberhard has been appointed Manager of Materials for the Chemical and Metallurgical Division of Sylvania Electric Products and will remain at Towanda, Pa., in his new position. . . . **Jack Collins** has been named manager of distribution and forecasting of Corning Glass Works' Consumer Products Division. . . . **Jim Littwitz** represented the Institute at the inauguration of the president of Roberts Wesleyan College in April. . . . The May issue of *Sky and Telescope* features an article by **Lawrence Aller** of U.C.L.A. on planetary nebulae.

Your secretary plans to be busy in June going to graduations, John's from White Plains High, he'll be going to Union College in the fall. Also to Nancy's from William Smith College where she majored in math. Nancy made Phi Beta Kappa and will be a Teaching Assistant while working for her masters at Albany State next year. For a guy who had some trouble with M-11 and M-12, I'm impressed! Let's hear from you all over the

summer. If you get within hooting distance of New York the latch-string is out and there is liquor on the bar (and the phone number is Area Code 914 White Plains 9-5948).—*Ken Rosett*, Class Secretary, 191 Albemarle Road, White Plains, N.Y. 10605

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Art Vershbow sent us an interesting article from *Materials Engineering* about *George Freedman*, who is manager of the Materials & Techniques Group in Raytheon's Microwave and Power Tube Division. The magazine featured a color picture of George on the cover and a fine exposition of George's theories on the use of advanced materials thinking as part of product development. . . . *Charles Hathaway* was elected as executive vice president of Torin Corporation, which was formerly known as The Torrington Manufacturing Company. Torin has eight modern buildings in five countries with 1,600 employees. Its stock became listed on the American Exchange on June 1.

F. Curtis Smith has been appointed manager of safety in the American Oil Company employee and public relations department. . . . *Augustin A. Root*, who is at the Center for Instructional Communications at Syracuse University, was the author of two interesting articles which appeared in *Engineering Education* in March. . . . *Jim Hoey's* daughter, *Eleanor*, was grand champion two weeks in a row at some outstanding horse shows in Massachusetts early in May. *Jim's* other daughter, *Mary Jane*, and his wife are also excellent horsewomen.

Your two secretaries, *Dick* and *Jack* (*Dick* is the straight man) have enjoyed writing these notes during the past year. *Jack* usually wrote his notes during his frequent trips to Tokyo, in heavy brush strokes on rice paper. *Dick's* notes were always signed, sealed and sworn to on legal cap. Best wishes for a happy summer.—*Richard M. Feingold*, Secretary, 266 Pearl St., Hartford, Conn. 06103; *A. J. Kelly, Jr.*, Associate Secretary, 34 Scudder Rd., Westfield, N.J. 07090

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As I write these notes, the 25th reunion of our Class scheduled for June 13-15 is still three weeks in the future. When these notes appear the reunion will be in the past, a collection of memories and mementoes for those classmates, spouses, and offspring able to attend. A full account of this important happening should appear in the next issue of the *Review*, scheduled to appear in October or November. As your present scribe, I may be asked to provide some inputs to those notes but I am looking forward to retirement from these duties which I assumed almost four years ago in September 1965 from *Paul Heilman*. There have been only two issues in four years in which no notes appeared. We have a

perfect record for the past two years, all three members of your secretariat having contributed columns this past year. *Paul Heilman* has been a steady contributor of news since he agreed to serve as assistant secretary. *Jack Barmby* has written the column whenever requested. Best wishes to my successor who will presumably have been elected by the class at the reunion. Unfortunately, I cannot claim to have accomplished much in terms of conditioning class members to communicate by telephone, postcard, letter, or alumni fund envelope flap. This pattern might change with more personal correspondence initiated by the secretary.

I was in Boston for the Spring Joint Computer Conference held May 14-16. On May 17, I spoke by telephone with *Jay Martin*, *Norm Sebell*, and *Stan Warshaw*. *Jay*, Chairman of our Reunion Arrangements Committee, reported that between April 28 and May 16 he had visited eight countries (Yugoslavia being one) on a business trip to Europe. He had just returned the previous evening. *Norm Sebell*, our Class Agent and Reunion Gift Chairman, says he has been occupied in negotiations to sell his company, *Ferresflex Corporation*, to *Compo Industries*. The transaction was completed May 1. *Ferresflex*, which *Norm* established in 1960, manufactures leatherboard from scrap leather. *Compo* began as a company manufacturing shoe machinery. *Norm* will continue as president of *Ferresflex*, now a wholly owned subsidiary of *Compo Industries*, and will also be a part of the management team of *Compo*. *Stan Warshaw*, our Reunion Book Editor, said everything was under control and that copies of the book were expected from the printer in a few weeks. *Stan* reports that getting the book ready was a real burden because in December, 1968, he moved *Technical Coatings, Inc.*, of which he is president, from Worcester to Route 128 at Needham. "We are now one of the 'little 128 companies'," says *Norm*. The decision to move was apparently made after *Norm* was launched in the collection and editing of material for the class book.

I tried to reach *Bob Breck*, Reunion Publicity Committee Chairman. *Bob's* son informed me that his father and mother were out playing tennis. I was unable to reach *Burt Bromfield*, *Mal Kispert*, or any member of those households.

Two notes from the fund envelopes: *Elios D. Cirelli* writes, "As of March 1, I have been appointed Standards Engineer for the Royal Typewriter Company, Research and Development Section." . . . *Lester Simon* writes from Mendham, N.J. "(I am) celebrating my 7th year as a partner of Arthur H. Richland Co., one of the country's largest firms specializing in acquisitions and mergers. (I am) in charge of our operations in the East. I find engineering training most helpful. (I am) also celebrating the 17th year in Mendham, the 13th year in the same house and, most important, the 19th year with the same wife."

Edwin G. Roos, Executive Vice President of the *Williams Co.*, and *Williams Real Estate Co., Inc.*, has written a letter to me from New York City saying he is looking forward to the 25th reunion. He enclosed a copy of the "Williams Letter" for December 1968, which describes the activities of his firm. Do you work at 1700 Broadway, 810 Seventh Ave., or 964 Third Ave.? The *Williams Real Estate Company* is the exclusive rental agent for three new office towers at these addresses. The buildings were completed or scheduled for completion in 1969. I suggest to Ed that he stay in touch with *Al Picardi*. *Al's* firm did the structural design on the John Hancock Center in Chicago and has been now awarded the structural design contract on a new 80-story tower building.

We have a few clippings and press releases. *William C. Kaesche* has been elected Vice President, Manufacturing, Engineering, and Purchasing for *Velsicol Chemical Corp.*, according to a press release of April 14 from the Chicago firm.

William H. Gray, of Brookfield, N.H., will head Computer Systems Operations, a new unit of *Honeywell's Electronic Data Processing Division*, Wellesley Hills, Mass. *Walter* has been with *Honeywell's EDP division* and its predecessors for 23 years. He joined *Raytheon* as junior engineer in 1946 and was named head of the peripheral equipment department when *Datamatic Corporation* was formed jointly by *Raytheon* and *Honeywell* in 1955. Two years later, *Honeywell* bought out *Raytheon's* interest.

Carroll W. Boyce is moving from Norwalk, Conn., to Washington, D.C., accompanied by his wife and three children. He has been named to the newly created post of Director of the Motor Truck Manufacturers Division of the Automobile Manufacturers Association, effective May 1 according to a Detroit press release of the A.M.A. dated April 3. *Carroll* has been with *McGraw-Hill, Inc.*, for 23 years and editor-in-chief of *Fleet Owner* for the past ten.

From *Alden A. "Bud" West*, of Newport News, Va., I have received a copy of a letter which he wrote on May 6 to Institute President *Howard W. Johnson* commenting on "student unrest" at M.I.T. and other camps throughout the country. In the letter, *Bud* requests a pledge from President *Johnson* that he will completely reject any student or faculty group "demands." He also calls for dismissal of any student, faculty, or staff member who participates in other than established grievance or appeal procedures. Apparently *Bud* is sending out copies of his letter to others. Both *Norm Sebell* and *Al Picardi* had received copies; *Bud* mailed the copy to me on May 19. I must say personally that I have been very favorably impressed with the way things are going at M.I.T. When I was in Cambridge on May 17, I visited the library in the Stratton Student Center which is open 24 hours a day. There, on the reference shelf, I found copies of



T. A. Hewson, '45

G. E. McKewen, '45

the Pounds Panel proceedings on the special laboratories at M.I.T. That panel is described in a letter also of May 6, from President Howard Johnson to all M.I.T. Alumni. I am sure there will have been much discussion of current events at our 25th reunion. Farewell from your Secretary.—*Paul M. Robinson, Jr.*, Information Systems Division, Navy Op-911H, Pentagon 2C342, Washington, D.C. 20350, 202-697-6115 or 7710 Jansen Drive, Springfield, Va. 22152, 703-451-8580; Assistant Secretaries: *John G. Barmby*, 924 Fairway Drive, Vienna, Va., 22100; *Paul M. Heilman, 2d.*, 30 Ellery Lane, Westport, Conn. 06880

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By now you should have received your first mailing from your 25th Reunion Committee. Yes, it was 27 years ago that the bulk of us started down the Institute "trail"; now is the time we should plan to return to the so-called scene of action for our 25th reunion activities in June 1970. Reunion Chairman *Tom McNamara* and his able Deputy Chairman *Bill Shuman* have been hard at work this past spring organizing the Committee as follows: *Jerry Quinnan*, Class Agent and Publicity; *Bill Meade*, again Treasurer (should we trust him?); *Bob Maglathlin*, 25-Year Book; *Dave Trageser*, Faculty Luncheon; *Bill McKay*, Program; *Charlie Hart*, Registration; and *Charlie Patterson*, Off Campus Activities.

Tom called yesterday to invite me to the Committee's first formal meeting next Wednesday, May 28—formal in that the wives will be along to start planning the children's activities. We cannot stress the importance of your completing at the earliest possible date the biographical data sheets that will be the basis of the 25th Reunion booklet. Ours, as you all know, is the Institute's smallest living class; thus, we require prompt and full response if we are to be able to issue a good book at a reasonable per capita cost. Early or prompt delivery of a Reunion Book fosters better attendance and interest!

In February, *Jeptha Wade*, formerly a partner at Choate, Hall and Stewart, joined Adams Russell Co., Inc., in

Waltham. . . . *William C. Wittmann, Jr.*, Scotch Plains, N.J., observed his 20th anniversary with Prudential Insurance last February. Bill, a Fellow, Life Management Institute, is associate director of Electronic Systems in Newark. Bill is married to the former Mary Kniazuk and their children are Mark, 17; Marcia, 14; and Leslie, 9. . . . *Alvin S. Cohen*, a New Rochelle, N.Y. resident, is Vice President of Campus Sweater and Sportswear Co., a Division of Interco, Inc. Al travels continually with four around the world trips in 1968 alone! In either a fit of rage or jealousy I should report that wife Debby accompanies Al on alternate trips. There are two Cohen children: Nancy, a freshman at Case Western Reserve in Cleveland; and Mark, a junior at Wilbraham Academy.

George E. McKewen, formerly of Sidney, Ohio, has been appointed Executive Vice President and General Manager of Champion Pneumatic Machinery Co., of Princeton, Ill. In his new position, George will be responsible for all corporate activities of this air compressor manufacturer with other plants in Belzoni, Miss., and Medford, Ore. George has been most active in the Compressed Air and Gas Institute as chairman of several standing committees and was lately Manager of Product Marketing, Pneumatic Equipment Division, Westinghouse Air Brake. You all must know that Dave Trageser, former Class President, has been named Vice President of High Voltage Engineering Corp.

Speaking of former class presidents, I received a most interesting letter from Chick Street earlier this year telling of his activities at Pearson, the Yacht Division of Grumman. As previously reported, Chick did so well in last year's 2000 Club race with Sara Ann his 10 year old Holland built wood hull sloop, that management suggested he unload same! Sara Ann has been sold within the week, so my Narragansett Bay spies report, and it is expected that Chick will be campaigning in a new Pearson 33-foot sloop in which the master played a major design role. Oh yes, Chick frost bites a Sunfish during the winter months!

Tom Hewson, present Class President, has been elected President of AEL

Applied Physics, Inc., a wholly owned subsidiary of Automation Engineering Laboratory, Inc., the brain child of Dick White, '48. Tom continues active in New Canaan, Conn., activities and also serves on the A.M.A.'s Research and Development Planning Council and M.I.T. Educational Council. While on Fairfield County residents, it should be mentioned that Fran and I spent a wonderful evening with Jim and Ellen Brayton in Weston earlier this month. At the time the evening was arranged it was thought that the *Jerry Pattersons* and *Pete Hickeys* would be on hand but no such luck. The Braytons have a gorgeous home on the banks of the Saugatuck River including, if you will, an old-fashioned swimming hole, not the typical pool of today. Jim, a Purchasing Agent at Turner Construction, is in his fifth or sixth year as Chairman of the local School Building Committee. Flint, the oldest child, has just completed his freshman year at Brown, Dana is away at Prep School, and Leslie remains at home as a freshman at Weston High.

Curt Beck of Pampa, Texas reports that he has signed up for another three-year term on the Educational Council. . . . *John W. Morrison, Jr.*, who visited with Tom McNamara in Boston earlier this month has just established a new business—Science Learning Systems—to create "self-teach" technical programs in high schools, colleges and business. . . . *Darwin G. Traver*, now Manager, Systems Equipment Development Department, has been with Carrier Corporation in Syracuse since Navy days. In his present position, Darwin is responsible for the development of new air conditioning equipment, a most demanding and enjoyable job. The family consists of wife,

Adeline; daughter Anita, 17; and son James, 15. . . . *Arthur L. Hall*, an old fraternity brother of mine, continues as Managing Director, Cabot S.A., in Spain. . . . *Jim Brayton* advises that Matthew "Red" Harrington does not enjoy his New Haven commute from Norwalk to Manhattan where Red holds marketing responsibilities with Shell Oil Corporation.

After receiving his Ph.D. in physics at Tech in 1949, *Dave Mintzer* taught at both Brown and Yale before going to Northwestern in 1962 as Professor of

Mechanical Engineering and Astronautical Sciences. This past year Dave has held a joint appointment as Professor of Astrophysics and Director of the Interdisciplinary Center for Astrophysics. . . . The *Lehigh Alumni Bulletin* reports that *Rollie Wiggin*, one of my sailing adversaries, in Noroton, has joined Eastern Airlines Properties and Facilities Department after several years in construction engineering for the Atomics Division of AMF.

In early February *Robert B. Hildebrand* was appointed Chief Engineer—Aerospace, at Boeing's headquarters in Seattle. With this appointment Bob becomes engineering functional director for the Aerospace Group. In his last assignment Bob was defense missile systems manager of the Missile and Information Division. I had an opportunity to talk with Bob—as well as *Dick Marsten* of R.C.A. in New Jersey—at this year's Alumni Student Weekend in mid-April; unfortunately, the schedule did not allow for any lengthy chit-chat. Although this 1969 Alumni-Student Weekend has been reported elsewhere I would be most remiss were I not to indicate how rewarding, and refreshing, an experience it was for me to eyeball the problems of the day with the Institute's young adults. When you consider that we were meeting at the time of the Harvard Square fiasco you can more fully appreciate the impact of our sessions.

Just learned from Edward H. Bowman, '48, that he returns to the Institute as Professor in the Sloan School after several years as Comptroller at Yale University. I had two or three sessions with *Julian Busby*, our Muskogee, Oklahoma, wild-catter, when he was in New York last month. I continue to enjoy hearing of Buzz's trials and adventures in this last frontier; as Buzz indicates it truly will be last if he loses his depletion allowance! These notes will be mailed enroute to Kennedy Airport and a rendezvous with Vince Butler in San Francisco next weekend. Don't forget your lonely secretary during these summer months!—*C. H. Springer*, Secretary, MFB Mutual Insurance Co., 420 Lexington Avenue, New York, N.Y. 10017

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Our threats and intimidations posed in a recent issue to you have brought some successful results. We have received a fine report from *Don E. Burke*, Course XVI. You are all now witness to our promise that none of the calamities threatened will be directed at Don, but I cannot promise that to those others who have been assigned to write reports on their activities these past years and have not complied.

Don, his wife and four children, Richard 17, Bob 15, Barbara 13 and Bill 9 live at 1818 Caesar Way South, St. Petersburg, Florida. They have lived in Florida for 11 years and so can be considered real Floridians.

Don is with the Municipal Bond Department of Goodbody and Co., and in the eight years he has earned the professional title of Chartered Municipal Financial Consultant. He acts as an advisor or consultant to cities, counties, school boards and other public agencies on their municipal bond financing programs. Don describes it as a broad field, seldom dull, with its shares of surprises, successes and failures. His contacts are politicians, attorneys, engineers, planners, architects (some excellent and some otherwise) and, of course, the public. You know the story of *not* the best possible scheme, but the best scheme possible. Don describes them as practitioners of the art of the possible. In spite of such instances he still comes into contact with wonderful people who are trying to plan, operate and govern their local communities for a better United States.

Don Robison, also a Course XVI man, lives only five blocks away and both men are active in the Educational Council and the local MIT club.

During the past years Don has received visits from *Bill Buss*, *Dick Krahe* and his wife, *Joni*, and invites any classmates coming to Florida to be sure to stop and see him. As extra incentive Don points out he lives across the street from a golf course and there is a tennis court on the next lot.

Commander D. L. Crinklaw is the Naval Communications Operations Officer at Norfolk, Va. The Commander has a wife and two children. His son is attending the University of Rochester under the Naval R.O.T.C. program and also intends a naval career.

Since the summer of 1962 *Seward J. Kennedy* has been abroad in his capacity as a lawyer with the Mobil Oil Co. The first five years Seward and his wife, *Sue*, lived in London, in a charming Georgian home in Chelsea. Very sadly, his *Sue* died suddenly as they were about to be transferred to the Mobil regional office in Paris. For these past two years Seward has lived in Paris, residing in a magnificent historic building on the Place des Vosges. His position requires considerable travel to Africa, Spain, Turkey, Portugal and the Middle East, but his love of his job and being overseas compensate for the inconvenience of travel. For those classmates planning a trip to Paris this summer, Seward would be most pleased to have you stop and see him. His phone at work is 744-75-19.

Ken Davis has been nominated by President Nixon to serve as Assistant Secretary of Commerce of domestic and international business. Ken is an I.B.M. executive who joined I.B.M. in 1949 after receiving an M.B.A. from Stanford. Ken rose through numerous sales, management, and financial positions to his present position of Vice President of I.B.M. in 1966.

Bob Marks has resigned as managing editor of *Power Magazine* to join the firm

of Michael Cather, Inc., where he will be responsible for industrial publicity and marketing. . . . *Frederick J. Ross, Jr.*, has been elected as group vice president, abrasive systems, of the Carborundum Company. . . . *Howard V. Permuter* has written a short but important article entitled, "The Tortuous Evolution of the Multinational Corporation," for the *Columbia Journal of World Business*. . . . Perhaps some of you saw the article on the "old" and the "new" *Roger Sonnabend* in a recent issue of *Business Week*. I liked the "old" Roger but I am not certain that all aspects of the "new" Roger are my bag. . . . Please take some time in the next few days and drop me a note on your activities. Your classmates will appreciate hearing about you.—*Russ Dostal*, Secretary, 18837 Palm Circle, Cleveland, Ohio 44126

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By now, the Bermuda reunion is history and new class officers will have won their various hotly contested elections. Among them will be a new secretary and so, as out-going secretary, I wish him as much pleasure as I have enjoyed while being responsible for this column. Being secretary has been a privilege in many ways because I have shared and helped relay your achievements and day-to-day doings. I have also shared your heartbreak. In so doing, I have learned a little about a lot of you and my overwhelming impression has to do with how well you are all doing. So keep up the good work and I'll see you at our record-smashing 25th reunion if not numerous times before that.

The mail bag brings personal news about four classmates. *Archie Harris* writes about the fabulous time he and *Audrey* had at the 21st Annual Fiesta put on by the M.I.T. Club of Mexico City. *Archie* says the fellowship was great, the M.I.T. spirit high, and his hosts were attentive to every detail. . . . *Robert O. Bigelow* says he has moved to a new home in Southboro, Mass., having previously resided in Hingham. On January 1, of this year, he was appointed Chief Electrical Engineer for the New England Electric System. In this position, it wouldn't surprise me if Bob does a little pondering about how to avoid future power black-outs. Just suppose the next one occurred in the dead of winter! Or just suppose the computers get the notion that we have been the victim of an enemy attack!

Malcolm C. Holtje reports that he has been back at M.I.T. as a full-time student and expects to have been graduated by now. I am somewhat nonplused as to what Malcolm is studying. He says he will receive the Engineer's degree in E.E. Well, according to the Alumni Register, Malcolm already has bachelor and masters degrees in E.E. Anyway, he'll be back at General Radio to set up a complete semiconductor facility.

Richard G. Alexander is president, technical director, and a principal owner of

Arvon Products Company, a coatings specialties firm. Dick has been a real leader in the paint industry and particularly as a member of the Philadelphia Society for Paint Technology. Because of his outstanding efforts in the paint industry, Dick recently received the Liberty Bell Award of the Society. Through his efforts, the paint industry has adopted the use of the computer in paint formulation and other areas of plant operation. In addition, Dick was one of the prime movers in establishing annual seminars which for ten years now have attracted top scientific speakers in the paint and associated industries.

A notice from the American Institute of Steel Construction announces the opening of that Institute's 1969 Architectural Awards of Excellence Program for the best building designs which used structural steel in imaginative and aesthetic ways. Recent buildings in all 50 states are eligible. Winners will be chosen by a 5-man jury of eminent architects, engineers, and editors. Among them is *Walter F. Wagner*, Editor of *Architectural Record*. . . . A brief note in *Astronautics and Aeronautics* for March says that *William C. Schneider* has succeeded the late Harold T. Luskin as Director of Apollo Applications at N.A.S.A. . . . A similarly brief note in the *Wall Street Journal* says that *Bill Edgerly* has been appointed vice president for finance of the Cabot Corporation (Boston). The Cabot Corporation deals in carbon black, oil and gas, and machinery.

Back in June, I wrote of the untimely deaths of *John C. Nygard* and *Bob Gregg*. At that time I wrote to the wives of both men in hopes of receiving more information. No word has arrived about John Nygard yet, but a touching letter from Marcia Gregg reads, in part, as follows: "Bob died at age 41 on October 26, 1968, in Memorial Hospital, Elmhurst, Illinois. He was ill only two months with cancer of the pancreas, one of those insidious conditions which, by the time it can be diagnosed, it's too late to do anything about. Bob had been with the Joseph J. Duffy Company, general contractors in Chicago, ever since graduation and was vice president. The company specializes in the building of schools, hospitals, etc. . . . Beside myself, he is survived by four school-age children, Candace, Robbie, Gregory and Sheryl; his father, and a sister. Bob was one of the 'good guys' who die young. A very active and loyal alumnus in the Chicago area, Bob was active in church work and local politics." The Greggs had hoped to attend the reunion. I regret that I cannot quote the whole of Marcia Gregg's letter. It was certainly beautifully written.

I am delighted to welcome back to this column *Frank Hulswit*, who so ably wrote these notes from 1959 to 1964. Be sure to keep him informed of all your new adventures, so he can again do an efficient job in presenting these notes to you.—*Fletcher Eaton*, Secretary, 42 Perry Drive, Needham, Mass. 02192

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Bob Cesari reports: "Now that spring is here, some of you are already making arrangements for this summer's vacation. *Bill Timson's* Reunion Committee is a whole year ahead, looking forward to our 20th reunion the weekend of June 12-14, 1970. The Site Selection subcommittee is busy inspecting various resort facilities, and other jobs are moving apace. I will keep you informed of the Committee's activities, and also you can expect to receive mailings from the Committee soon. Be sure to mark your calendar for reunion weekend. I'm sure you'll have a terrific time.—*J. T. McKenna*, Boston Gas, 144 McBride St., Boston, Mass. 02130

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A newspaper clipping showed *Clark Abt* watching the tryout of multimedia instructional aids at a workshop at the New York Institute of Technology. The workshop was sponsored by the U. S. Office of Education. Clark heads up an educational research firm in Cambridge. . . . *Robert Butters* is now the sales promotion and advertising manager for Industrial Nuclearics Corporation. He has a chance to visit Boston occasionally in the course of working with the advertising agency. . . . *James H. Ballou* has started on the restoration of an old and historic home in the Roxbury section of Boston. Jim is an architect, with his office in Salem, Mass., and was selected for this undertaking by the Massachusetts Historical Commission. This project is the first of its kind with sponsorship by federal, state and private funds.

David I. Caplan writes that he is "now the manager of software systems, a computer programming activity in the Space and Information Systems Division of Raytheon." . . . *George M. Colvill* has moved to Houston, Texas, to start his own business: Colvill Industrial Sales. He represents his former employer, Tool Steel Gear and Pinion Company, in five states and in Mexico. He also represents Cleveland Worm and Gear, and a Division of Eaton, Towne & Yale. A second company is involved in the design, installation and maintenance of automatic lubricating systems. Sounds awfully busy—good luck and thanks for the nice letter, George. . . . And another classmate who is sympathetic to the Class Secretaries' cause sent in the following information: *John P. Dowds* is President of Adamana Ltd., a gas and oil producing firm in Oklahoma City. He has been giving a number of papers dealing with oil rock formation and methods of predicting sources of oil.

He participated in a symposium, Computers and Operations Research in Mineral Industries, at the Colorado School of Mines. John is a well-known consultant in these fields. In whatever spare time he has he has served on the Board of Governors of the M.I.T. Club of Oklahoma and was regional chairman of the 1968 Alumni Fund Drive. He and Joan have

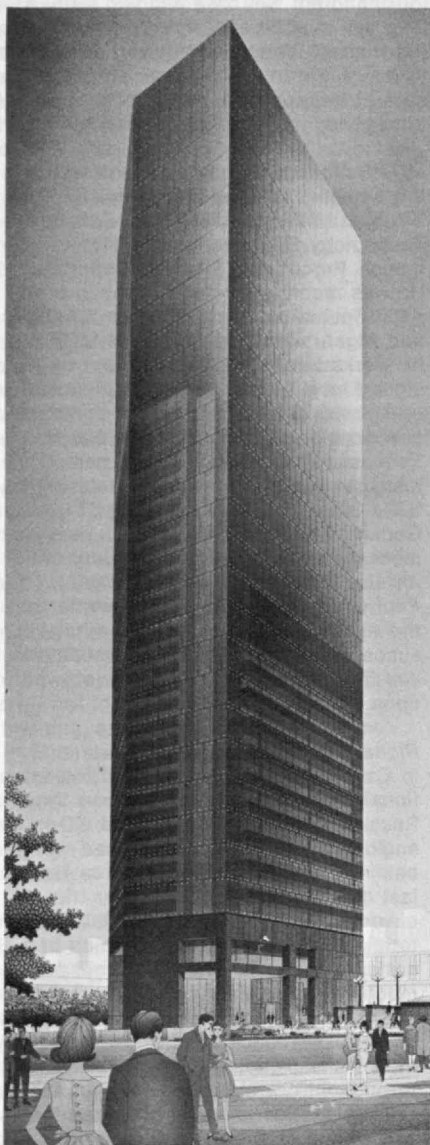
four children: two boys and two girls. A long list of additional activities suggests the truth of the saying: "If you have a job to do, give it to a busy man." (I'm not sure of the appropriateness of the remark after giving his family statistics!)

MITRE Matters had an article describing the activities of *Carl Engelman*, S.M. XVIII. At MITRE Carl is in the Software Technology Subdepartment of the Information Processing Systems Department. He was recently elected Chairman of the ACM Special Interest Group on Symbolic and Algebraic Manipulation. At MITRE he works on MATHLAB, a project designed to give mathematical scientists on-line assistance in symbolic computation on a dialogue basis. . . . *John R. Eshbach*, Ph.D. VIII, has been named manager of the Microwave Branch of the Solid State Physics Laboratory of the General Electric Research and Development Center. He, his wife and four children live in Schenectady, New York. . . . *Paul Grady*, Westport, Conn., wrote that the Alumni Fund telethon was a huge success in this area. He congratulated *Jim Russell* and his team for a job well done.

Richard H. Howe and his wife were in Czechoslovakia for the 23rd International Geological Congress when the Russians took over. He reports: "Our engineering geology field trip had been a great success, planned to the last detail. We also made other trips to caves and castles, mines and laboratories. The formal sessions, which had gotten off to a fine start, continued with much reduced attendance for three days after the invasion. Then we went by train to Germany. The Czechs' concern for their visiting geologists continued throughout our stay, even waiting at the railroad station to help each departing group as it arrived from their dorm or hotel."

Walter C. Kinzinger wrote that his wife Marian delivered a baby girl (Jean Marian) to add to their all male (2) family. Walt has been transferred from Bolling AFB to a new MITRE facility in McLean, Va. . . . *Daniel Macero* has been elected Chairman of the Syracuse Section of the American Chemical Society. . . . *Alexander A. Padis*, N.E. XIII-A, is now a senior engineer in the Advanced Marine Technical Division of Litton Systems in Cambridge, Mass. . . . *Peter Silveston* spent a summer in Washington, D.C. as Assistant to the Director of Research of the F.W.P.C.A. and is now back at the University of Waterloo, Ontario, Canada, where he is an Associate Professor, Department of Chemical Engineering. . . . And among the academicians, *Mert Flemings* has been promoted to Professor, Metallurgy and Materials Science at M.I.T.

E. Leigh Secrest, Ph.D. VIII, Dean of the Graduate School, Texas Christian University, was recently elected to the Board of Directors of the Council of Oak Ridge Associated Universities. He also serves as President of the TCU Research Foundation and is Vice Chancellor for ad-



George E. Kostritsky, M.C.P.'51, has won the architectural competition for the design of an office tower in Charles Center, 33-acre urban renewal project in Baltimore, Md. The winning design is an irregularly-shaped 23-story tower sheathed in panels of solar-gray laminated glass fastened with faceted stainless steel buttons, the first exterior treatment of its kind, according to Mr. Kostritsky. He is a member of the Baltimore firm of Rogers, Taliaferro, Kostritsky, Lamb, Architects/Planners.

vanced studies and research at TCU. . . . Last November Howard Simmons was a round table discussion leader at the Robert A. Welch Foundation Conference on Chemical Research, in Houston. He is a research supervisor in the central research department at the experimental station of duPont. He is also serving on the Editorial Board of *Accounts of Chemical Research*. . . . Joseph Tamsky, M.C.P. IV-B, resigned as Town Planner of Manchester, Conn., to become the Director of Planning at Norwalk. He had been instrumental in revising Manchester's zoning ordinances and left to find more varied challenges. That seems to be a common quest these days.

Richard Towill is president of the R. M. Towill Corp. which has projects in Hawaii, San Francisco, Saigon and other places in the Pacific Basin.

Theodore P. Ballas has been promoted to Director of New Projects Development at AVCO Missile Systems Division. The Ballases have two children and live in Lexington, Mass. . . . Arthur Wasserman put more information on the back of the news postcards than anyone I have seen so far. He joined Allis-Chalmers in Milwaukee as Director of Engineering in the Research Division. His staff is concerned with establishing engineering cost and feasibility of new products and processes conceived by the rest of the Division. He is "going back to school," he has enrolled in the University of Chicago's equivalent of M.I.T.'s Sloan School: The Executive Program and will get this M.B.A. in June 1970 (hopefully). The Wasserman's also reported that they see Warren Rowland and the Forest Monkmans once in a while and Monk has now left Allis Chalmers. . . . John J. Welch, Jr., has been named Vice President and Manager of the Missiles and Space Division—Texas, of LTV Aerospace Corp. He has been with LTV for 17 years. . . . John H. Wilson is with Martin Aircraft Company in Denver. He and Esther and their three children live in Littleton, Colorado. No news about his job but he writes that he enjoys hiking, gardening, chess and studying the stock market. . . . Well here's wishing you all a bull market all summer long, enjoy yourself, write, and see you in the fall.—Marshall E. Alper, Assistant Secretary, 1130 Coronet Avenue, Pasadena, Calif. 91107; Howard Levington, Secretary, 358 Emerson Rd., Lexington, Mass. 02173; Assistant Secretaries: Walter O. Davis, 346 Forest Ave., Brockton, Mass. 02402; Paul Smith, 11 Old Farm Rd., N. Caldwell, N. J. 07006

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Architects are in the news this month. Robert H. Fowble, who was awarded his Master of Architecture degree in 1952, has incorporated his architectural and planning firm, Robert H. Fowble & Associates, Inc., in San Diego, Calif. Mr. Fowble has specialized in the design of schools, commercial and industrial buildings in the San Diego and Imperial Counties of California. . . . Clifford Morse, an associate partner with the Architects' Collaboratives in Cambridge, Mass., reports that he has been living in M.I.T.'s experimental solar house number IV, which has now been "desolarized" to conventional heating. . . . John Rauma is now lecturer in architecture at the School of Architecture in the University of Minnesota and a partner in the firm of Griswold & Rauma, Architects, Minneapolis.

In chemistry and chemical engineering a number of classmates are making the news. Severo Amagna reports that he is now assistant general manager, Refining Division, Caltex (Philippines), Inc., P.O. Box 783, Manila, Philippines. . . . Travel-

ling the world as duPont's Safety and Fire Protection Survey Engineer is Richard W. Prugh. . . . Clifford M. Sayre, Jr., writes that he is just completing highly successful startups of nylon intermediates plants at Victoria, Texas. One of these plants produces material for "Qiana," duPont's new silk-like fiber. Cliff also writes that his son, Frank, is now at the University of Texas and his daughter, Elizabeth, is nearing her fourth birthday.

More of our classmates are advancing up the management ladders of nationally-known firms. Continental Can Company reports that Jess L. Belser has been appointed assistant general manager of Continental Can Company's Eastern Metal Division. Currently, Jess is studying at the Harvard University Graduate School of Business. . . . Linde Division of Union Carbide has announced that Richard S. Paul has been appointed as Associate Director of Process and Product Development at the Cryogenics Department at Tonawanda, N.Y. Mr. Paul has been with the Linde Division since 1953 when he received his M.S. degree in Chemical Engineering from M.I.T. . . . John M. Prizer has been named controller of the Highland Park (Michigan) tractor plant, Ford Tractor Operations, of Ford Motor Company. John, his wife and five children are residents of Birmingham, Michigan.

Lowell W. Smith, Course XIII-C, is now Manager of Operations, Pacific Region, for Wang Laboratories. Lowell has long been an avid international 210-Class sailboat racer at Marblehead and will show the west coast sailors how races are won. . . . From the month's mail we learn that Howard K. Larson is now Chief, Thermo Protection Branch, N.A.S.A.'s Ames Research Center and that Norman C. Dahl is the Deputy Representative in India for the Ford Foundation. . . . J. F. Moore has recently written an article, "Systems Approach to Refinery Design and Operations" for *Chemical Engineering Progress*. Mr. Moore was a co-founder in 1956 of Bonner & Moore Associates, Inc., Houston, Texas. Bonner & Moore are involved in studies of industrial expansion, investment evaluation, plant simulation and operations research. —Arthur S. Turner, Secretary, Lowell St., Carlisle, Mass. 01741

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Richard Hayes, Director of Technical Programs at N.A.S.A.'s Electronic Research Center in Cambridge, has been appointed to the N.A.T.O. advisory group for Aerospace R&D. . . . Major Frederick Hofmann has received his third award of the U.S.A.F. Commendation Medal for meritorious service as Systems Engineering Staff Officer, in the office of the Deputy Chief of Staff for Systems at Andrews AFB, Md. . . . John D. Griffiths recently graduated from the Air War College (the senior Air Force professional school) and is on the electrical engineering faculty at the Air Force Academy in Colorado.



J. L. Belser, '52



W. E. Horton, '56

J. E. Hazard now has three sons and two daughters and is designing paper converting machinery for Scott Paper Company. He reports that wife Ann paints, teaches part-time, and takes care of him in her spare time and that he won the Aquacat Catamaran National Championship in 1967. . . . **William B. Gleckman** is engaged in the practice of architecture in Manhattan designing apartment houses and redesigning "brown-stones." . . . **George Inada** attended the 1969 annual meeting of the President's Committee on Employment of the Handicapped. Attendance was by Presidential invitation, based upon recommendation of organizations and agencies in the field of the handicapped. George is personally interested in removing any barriers to the employment of the handicapped, especially those with chronic conditions. He is with the MITRE Corporation at McLean, Va., and lives with his wife and daughter in Bethesda, Md.

John E. Preschlack is still in Germany (Dusseldorf) with McKinsey and Company, management consultants. He reports that he is having a great time but plans to return to New York (Chappaqua) next year. . . . **Joseph S. Pressner** is assistant to the Vice President at Aurora Plastics Corporation

Charles (Chuck) Leonard is Vermont's Engineer of the Year. Chuck lost his sight in 1964, a victim of retinopathy, yet he skis, sails, golfs, and plays pool with the aid of electronic gadgets he has invented to help him "zero in" on objects. He uses an ultrasonic device for skiing and dreams of improving guidance devices for the use of all who are blind. He is employed by General Electric's Armament Division in Burlington, Vt. Our hats off to Vermont's Engineer of the Year, Joseph S. Pressner!—**E. David Howes**, Secretary, Box 66 Carlisle, Mass. 01741

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Tom Comparato is a task manager in the systems engineering group of the Missile Systems Division of Avco. Tom is married to the former Josephine Messing of the Registrar's office and they have five children. . . . **Bill Horton** has been ap-

pointed latex manager of the new Goodrich Chemical plant in Pedricktown, N.J. Bill was formerly a senior engineer at the Akron plant. . . . **John Mueller** has become the national sales manager of Household-Grocery Products Division of Alberto-Culver. In the past John has worked for Dow Chemical, Abbott Labs and Norse Chemical. **Mike Schiller** is President of Sequential Information Systems, Inc., a manufacturer of optical encoders.

At the 1969 M.I.T. Open House on May 3, **Russ Schweickart** was on hand to describe his recent Apollo flight. Russ arrived via helicopter on Briggs Field. . . . **Hank Valcour** is technical director of Ionics' program to develop a large volume household desalination unit. Hank and wife now have five children. . . . **Joe Wauters** is regional sales manager in New York of the Arkwright-Boston Insurance Company. . . . Last year **Bruce Wedlock** served as faculty advisor on a project to design a low cost solid state spectrometer for Instructional Purposes and the success of the effort was recorded in the December *IEEE Transactions*.

Dan Wolfson was married on March 30 to Sheila Mizel, an artist for *Mademoiselle Magazine*. Dan is in charge of New York urban renewal work for Tishman and is currently building nine apartment buildings and one major office building. . . . **Elwood Wood** has been appointed Vice President of W.R. Grace's Polyfibron Division with responsibility for printing and textile finishing products. In the next issue we expect to have a definitive report on the fifteenth reunion plans.—**Co-secretaries: Bruce B. Bredehoff**, 16 Millbrook Rd., Westwood, Mass. 02090; **T. Guy Spencer, Jr.**, 73 Church St., Weston, Mass. 02193

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George Waugh has been promoted to the position of Manager at the Montville, Conn., plant of the Naval Products Division of the United Nuclear Corporation. George has been with United Nuclear for 11 years and has been involved in many phases of the company's operations. He and his family live in Madison, Conn. . . .

Bob Laflamme who has been specializing in the design of software for on-line control and management information systems, has been appointed Director of Programming of Keydata, the Computer Services Division of Keydata and Adams Associates Incorporated. Bob was prominent in the early development of the Keydata time-sharing executive system. Later, he participated in the design and evaluation of large-scale on-line computer systems as well as numerous studies of computer usage and requirements. The major software systems designed by Bob include a generalized message-processing monitor and data reduction system for reducing doppler range mapping data of the moon

A news release from the Water Pollution Control Federation gives us the news that **Bruce Blanchard** presented an assessment of the nation's water resources at the Federation's 41st Annual Conference last fall. Bruce is a Senior Staff specialist for the Water Resources Council, Washington, D.C. . . . **Stanley Wand** has been promoted to vice president/manufacturing of Slant/Fin Corporation. Stanley joined Slant/Fin as engineering manager in April, 1964. In February, 1966, he was promoted to manufacturing manager responsible for all production divisions including metalworking, machine shop, maintenance, production control, air and conditioning and heating products. Stanley has extensive training and experience in both technical and managerial areas. He received a master's degree in business administration from CCNY in 1964. Prior to joining Slant/Fin, he was a senior project engineer at Koppers Company and served as consultant to a number of companies including Bendix Corporation and Thiokol Chemical Corporation. Stanley lives in Jamaica, N.Y., and has two sons.

James V. Forrestal Chair

And two items about **Ed Roberts**. First, a few months ago, Ed addressed a meeting at the United States Embassy in London on "Technical Entrepreneurship." Ed and some of his associates at M.I.T. have studied 200 small companies started by scientists, in an attempt to ascertain factors crucial in success. Second, a copy of a letter from the Naval War College in Newport Rhode Island to *Technology Review* brought the news that Ed was

appointed, in July 1968, to the James V. Forrestal chair at the Naval War College. This appointment was for a period of one year. The Forrestal chair is one of the nine current chairs at the Naval War College. The letter continued: "As the Forrestal Professor, Professor Roberts delivers formal lectures in the field of management to the three resident schools of the Naval War College, conducts research seminars during the Winter Term at the College and provides advice and guidance to students who are undertaking research in his area. Following the winter term, Professor Roberts will conduct a Spring Term Management elective which is designed for the intellectual enrichment of his students rather than as a research vehicle."

"In addition to the aforementioned duties, Professor Roberts will participate in the Naval War College's Senior Officer Executive Management Course. This three week course is conducted during the summer for Flag/General Officer Selectees and other Senior Officers with direct interest in modern management technology. Besides participating actively in the preparation and conduct of this course, Professor Roberts is also a member of the President's Advisory Committee, chaired by Professor Zenon S. Zennetos of the Sloan School of Management. In addition to his purely academic functions, Professor Roberts provides advice and guidance to the president, Staff and Faculty of the Naval War College on matters pertaining to modern management education."

That's all the news I have; please drop me a line when you can.—*Frederick L. Morefield*, Secretary, 18 Whaddon House, William Mews, London SW 1, England

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Memo to Class of '58: Dust off your Royal Canadian Air Force Exercise Book and shape up! *Jason Taylor* ran the B.A.A. Marathon this year and keeps in training by running 60 miles per week all year. Most of us claim we're too busy but he manages to work full-time at Avco in Wilmington, teach evening courses at Northeastern University, and help his wife with their three children, Michael 8, James 6, and Daniel 1. . . . For those who may not care to jog through the countryside, there are other activities concerned with simply preserving the countryside for others, such as the Sierra Club for which *Jeffrey Ingram* is working. Jeff is the Southwest representative for the Sierra Club and has written several articles discussing the role of the Public Land Law Review Commission.

Lee Freese is one of the partners and founders of the new consulting engineering firm of Freese, Nichols and Esmond. Their firm serves the Fort Worth, western Texas and New Mexico areas. . . . *Richard Hatch* is a principal research engineer at the Foxboro Company in Foxboro, Mass., and has recently participated in technical sessions at the In-

strument Society of America Conference and at the Boston section of the A.S.M.E. . . . *Howard Salwen* is working at AdCom division of Teledyne, he reports, along with many other M.I.T.'ers. He and his wife Laura are living in Brookline, Mass., and have one child—David, age two. Howard recently coauthored a paper in the *IEEE Transactions on Aerospace and Electronic Systems* relating to navigation and tracking systems.

Another proud father is *Daniel Raichel*, whose wife Geri presented them with a son, Adam Mark, this past fall. . . . *Michael Miller* is presently assistant professor of pediatrics at the University of Pennsylvania School of Medicine and is also director of Clinical Immunology Laboratory at Children's Hospital of Philadelphia. He is living in Narberth, Pa., with his wife, the former Paula Berkman, a Simmons College graduate, and their three children, Carolyn Sue 7, Lisa Ann 5, and Richard Bruce 2.

More entrepreneurs in the Class. *James Hetherington* has started his own engineering business in Palo Alto, Calif., working with vacuum metallurgical processes. He and his wife and three children report they are enjoying California when they find time for it with Jim's new business. . . . *Fred Cox* is the founder and president of Micro Systems, Inc., in Santa Ana, California. The company was formed in June 1968 and manufactures and sells small general purpose digital computers and core memory systems. . . . And in this regard, yours truly is a principal and vice president of TMA, management consultants, in Concord, Mass. David W. Braun, '48, and I acquired the firm in January this year. Our firm provides services exclusively to companies whose products or services involve a high degree of technology or science.

Here's a great letter from *Stan Klein*: "First, I would like to report that my roommate from M.I.T. *Cole Bess*, has recently returned to the Boston area with his wife, Judy, and two adorable girls, Jane and Elizabeth. Cole had left Quaker Chemical to become business manager for the Pilot Chemicals Division of New England Nuclear Corporation. He would like to get in touch with classmates that are also in the area. As for myself, I was married a little over two years ago to the then Bonnie Kameny, a graduate of the Fashion Institute of Technology. The announcement was a natural: 'M.I.T. has F.I.T.' I am no longer working in science and technology per se, but do follow new technological developments as eastern editor for *Machine Design* magazine. Late last year, I also launched another career as host of my own twice monthly radio program in which I interview guests on technical subjects. In March, the *New York Times* published my first book, *The Careless Atom*, which is a significant breakthrough for me in writing for the mass media. Should any classmates be coming to New York City, I would love to hear from them—who knows they might find themselves either in print or on the air."

Another letter from *Louis Spradlin*: "My wife, Sylvia, and I with children Heather 7, and Greg 3, live in Schenectady, N.Y., where I am a systems engineer with General Electric Drive Systems Group. Most recent activities have been in developing process modeling techniques for on-line industrial process computer control systems. We enjoy this part of the country except for the thawing season!"

At Foote Cone and Belding, Inc., in Chicago, *Paul Repetto* has been named to the position of account supervisor. He had joined this firm in 1966 and worked as an account executive prior to his promotion to the new position. Before that, Paul was an account executive with N. W. Ayer in Philadelphia. . . . *Norman Day* is now associate professor of architecture and city planning at the University of Pennsylvania Graduate School of Fine Arts. He has also been the chairman of the program in urban design for the past year. . . . *Cooper Wayman* has received a Doctor of Jurisprudence degree from the University of Denver. . . . *Alan Marcovitz* is associate professor in the electrical engineering department at the University of Maryland. He has recently had an article published, "Syntactic Approaches to Teaching Computer Languages." . . . *Robert Lee* is the investment accounting officer with the M.I.T. Comptroller's Office. He and his wife have four children, three boys and one girl, and are living in Burlington, Mass.

Donald Callahan is now based in Brussels and he is very interested in meeting other M.I.T. Alumni, particularly '58ers, who may be in the area for the purpose of organizing an M.I.T. Alumni Club there.

Travis Amis, in addition to his duties as vice president of the Missouri Valley Machinery Company, is also secretary-treasurer of the Used Construction Equipment Research Corporation, which is a national organization of construction equipment distributors which includes the U.S. and Canada. He reports that they now have a third child, a daughter Kay, who is now one year old this month.

Carl Schwarz is now with the International Department of U.S. Steel in Pittsburgh where he is engaged in developing, analyzing, and recommending new foreign investment situations. Prior to this he was manager, commercial research for U.S.S. Chemicals Division of U.S. Steel. While in New York, he completed both an M.B.A. and LL.B. at N.Y.U. His note says that "my spare time activities are: (1) wife!, (2) real estate investments, (3) travel, and (4) study." . . . *Toby Carlson* is in Miami, Fla., with the Hurricane Research Laboratory of ESSA doing research in tropical meteorology. Their second child, Joel, is now one year old. According to his letter: "My main hobby, which I share with my wife, Arabelle, is music, playing recorders, harpsichord, etc." . . . See you all in the fall.—*Michael E. Brose*, Secretary, 1171 North St., Walpole, Mass. 02081; *Antonia*

FIFTH ANNUAL TOUR PROGRAM—1969

This unique program of tours is offered to alumni of Harvard, Yale, Princeton and M.I.T. and their families. The tours are based on special reduced air fares which offer savings of hundreds of dollars on air travel. The tour to India, for example, is based on a special fare, available only to groups and only in conjunction with a tour, which is almost \$400 less than the regular air fare. Special rates have also been obtained from hotels and sightseeing companies. Air travel is on regularly scheduled jet flights of major airlines.

The tour program covers four areas where those who might otherwise prefer to travel independently will find it advantageous to travel with a group. The itineraries have been carefully constructed to combine the freedom of individual travel with the convenience and saving of group travel. There is an avoidance of regimentation and an emphasis on leisure time, while a comprehensive program of sightseeing ensures a visit to all major points of interest. Hotel reservations are made as much as a year and a half in advance to ensure the finest in accommodations.

THE ORIENT

30 DAYS \$1569

Mar. 22, Jun. 28, Jul. 26, Sept. 20

1969 will make the fifth consecutive year of operation for this fine tour, which offers the true highlights of the Orient at a sensible and realistic pace. Eleven days will be spent in JAPAN, divided between TOKYO, the ancient "classical" city of KYOTO, and the FUJI-HAKONE NATIONAL PARK, with excursions to NARA and NIKKO. Five days will be spent in HONG KONG and four in the fascinating city of BANGKOK. Shorter visits to SINGAPORE and the lovely island of FORMOSA complete the itinerary. Optional pre and post tour stops may be made in HONOLULU and the WEST COAST at no additional air fare.

A complete program of sightseeing will include all major points of scenic, cultural and historic interest. Features range from a tour of the canals and floating markets of Bangkok, an authentic Javanese "Rijst-tafel" in Singapore, and a launch tour of Hong Kong harbor at sunset, to a "Mongolian Barbecue" in Taipei, and a trip on the ultra-modern 125 m.p.h. express trains of Japan.

Tour dates have been chosen to coincide with outstanding seasonal attractions in Japan, such as the spring cherry blossoms, and beautiful autumn leaves, and some of the greatest annual festivals in the Far East. Total cost is \$1569 from California, \$1739 from Chicago, \$1807 from New York. Special rates from other cities.

INDIA

Including NEPAL and PERSIA

29 DAYS \$1636

Mar. 15, Mar. 22, Aug. 2, Oct. 4

An unusual opportunity to see the diverse and fascinating subcontinent of



India, together with the once-forbidden kingdom of Nepal and the rarely-seen splendors of ancient Persia. Here is India from the mighty Himalayas to the palm-fringed Bay of Bengal: the great seaport of BOMBAY; the magnificent cave temples of AJANTA and ELLORA, whose thousand year old frescoes are among the outstanding achievements of Indian art; MADRAS, in the south; the great industrial city of CALCUTTA; a thrilling flight into the Himalayas to KATHMANDU, capital of NEPAL, where ancient palaces and temples abound in a land still relatively untouched by modern civilization; the holy city of BENARES on the sacred River Ganges; AGRA, with not only the Taj Mahal, but many other celebrated monuments of the Moghul period such as the Agra Fort and the fabulous deserted city of Fatehpur Sikri; the walled "pink city" of JAIPUR with an elephant ride at nearby Amber Fort; the unique "lake city" of UDAIPUR, with its delicate white marble palaces; the great capital of NEW DELHI; and the fabled beauty of the VALE OF KASHMIR, surrounded by the snow-clad Himalayas. PERSIA (Iran) includes visits to PERSEPOLIS, the great royal capital of Darius and Xerxes in the 5th century B.C.; and ISHFAHAN, the fabled city of the 15th-17th century Persian Renaissance, with its delicate white gardens, bazaar, and famous tiled mosques. Outstanding accommodations include hotels that once were palaces of Maharajas and luxurious houseboats on Dal Lake in Kashmir. Total cost is \$1636 from New York.

SOUTH AMERICA

31 DAYS \$1599

Jan. 18, Jul. 26, Oct. 18

An original itinerary which takes unusually full advantage of South America's great scenic and cultural attractions. The trip descends along the West Coast, dominated by the towering Andes and filled with the churches and mansions of 16th and 17th century Spain, and returns through the modern cities and lush scenery of the East Coast. Stops include Spanish colonial QUITO, with the nearby Indian market at AMBATO and a drive along the snow-capped peaks of "VOLCANO ALLEY"; Pizarro's great viceregal capital of LIMA; the ancient city of CUZCO and the fabulous "lost city" of MACHU PICCHU; lovely SANTIAGO in Chile; cosmopolitan BUENOS AIRES, the continent's largest city; BARILOCHE, in the beautiful ARGENTINE LAKE DISTRICT; spectacular IGUAASSU FALLS (largest in the world); the sun-drenched beaches of RIO DE JANEIRO (considered by many the most beautiful city in

the world); the quaint and historic town of OURO PRETO (so revered by Brazilians that the entire town is preserved by law as a national museum); the striking contemporary architecture of BRASILIA; and PANAMA CITY with the Panama Canal, Spanish ruins, and free-port shopping. These great points of interest are complemented by an assemblage of South America's truly outstanding hotels. Total cost is \$1599 from New York. Special rates from other cities.

EAST AFRICA

22 DAYS \$1549

Jul. 14, Jul. 28, Sept. 22

A luxury "safari" to the great national parks and game reserves of Uganda, Kenya and Tanzania. These offer a unique combination of magnificent wildlife and breathtaking natural scenery: great herds of elephant in QUEEN ELIZABETH PARK, in the shadow of the fabled "Mountains of the Moon"; a launch trip on the White Nile through hippo and crocodile to the base of the thundering MURCHISON FALLS; multitudes of lion and other plains game in the famous SERENGETI PLAINS and the MASAI-MARA RESERVE; the spectacular concentration of animal life in the NGORONGORO CRATER; tree-climbing lions around the shores of LAKE MANYARA; and the AMBOSELI RESERVE, where all types of big game can be photographed against the towering backdrop of snow-clad Mt. Kilimanjaro. Air travel is used where possible, enabling longer stays within the parks. Also seen are the fascinating capital cities of KAMPALA, NAIROBI and DAR ES SALAAM, the exotic "spice island" of ZANZIBAR, and the historic MOMBASA, a beach resort on the Indian Ocean, with its colorful Arab quarter and great 16th century Portuguese fort. Tour dates have been chosen for dry seasons, when game viewing is at its best. The altitude of most areas provides an unusually stimulating climate, with bright days and crisp evenings (frequently around a campfire). Accommodations range from luxury hotels in modern cities to surprisingly comfortable lodges in the national parks (some equipped even with swimming pools). Total cost from New York is \$1549.

Rates include Jet Air, Deluxe Hotels, Meals, Sightseeing, Transfers, Tips and Taxes. Individual brochures are available on each tour.

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R. Hodges, Jr., '60

G. J. Pillorge, '60

L. M. Coris, '61

D. Schuman, Western Associate, 22400 Napa St., Canoga Park, Calif.

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Ken Freeman called early one morning, early in May; he and Mimi have a second daughter, Lisa Kimberley, who weighed in at 9 pounds 13 ounces. Ken and Mimi, daughter Jennifer and the new arrival will be heading west in July. Ken has joined the philosophy faculty at Colorado State University. . . . I've also talked on the phone with Jim Middlekauff; he is Assistant to the Vice President of the Watts Regulator Co., in Lawrence, Mass. Jim was at American Cyanamid before going to Watts; he, his wife and two children are living in Lynnfield. Jim is an active alumnus for Theta Chi and was headed for a trustees meeting when I spoke with him.

Tom and Barbi Farquhar were here the other evening—we were rehearsing for the reunion. That's right, our 10th reunion is less than a year away. Save the weekend before Alumni Day (roughly the second week in June) 1970 for an extended party. The Reunion Committee will be working over the summer, so you should be hearing from that august group pretty soon. Speaking of which, if you'd like to join that august group, give Tom or me a call.

I have a note from George Pillorge, and a press release about his appointment as a partner in an architectural and planning firm. George writes that, after leaving M.I.T. in 1960, he got a master's in architecture and a master's in city planning from Harvard, went on a Fulbright to Paris, and was a Visiting Professor at Harvard, 1967-68. He has just been appointed a partner and corporate officer of R.T.K.L., Inc., in Baltimore. George, who has been a member of the firm since 1964, is Vice President for Marketing. Since joining R.T.K.L., George has been involved with the planning and design of Montgomery Village, a new town for 30,000 people Gaithersburg, Md.; Sea Pines Plantation—a beach club and conference center on Hilton Heath Island, S.C.; and Charles Plaza, a park in Baltimore's Charles Center. While he was at Harvard in 1967, George directed a re-

search project which explored the potentials of experimental new towns for low income families. George married Deborah Brown from Connecticut College in 1962; they now have two children—Marc, age 4 and Nicole, age 2.

Roger Mark says: "We will complete our tour of duty with the U.S.A.F. (Medical Corps) this July. Our stay here at Kirkland AFB, N.M., has been very enjoyable and worthwhile. Dottie and I with our children Betsy and Bryan will be traveling back East during the summer. In the fall I will begin teaching and doing research in biomedical engineering at M.I.T. and Harvard Medical School. I'll be Instructor of Medicine at H.M.S. and Assistant Professor of Electrical Engineering at M.I.T. We look forward to living in Boston again, and the work promises to be very exciting."

Richard Samaha is completing his first year as a Clinical Associate of the Medicine Branch, National Cancer Institute, N.I.H., Bethesda, Md. . . . Craig Sawyer has been working for General Electric's Nuclear Thermionic Power Operation as a Senior Engineer since he left the Army in 1966. He has recently been promoted to Manager-Power Plant Engineering. . . . Bill Kleinbecker is an Account Representative for I.B.M. in Hartford, Conn. He says, "We now have three children—one girl and two boys; the latest addition is Eric Carlton, who was born November 24, 1968." . . . Another Connecticut resident is Larry Brock; Larry got out of the Air Force last September and moved back to Burlington, Conn. He is working at Hamilton Standard System Center in Farmington. Larry reports that he has two sons, David (7) and Stephen (18 months).

Bob Hodges has been appointed Production Manager of the Chandler Division of the Rogers Corporation; previously he was Product Manufacturing Manager of the Arizona Division of Components, Inc., in Phoenix. (The Chandler Division of Rogers manufactures flexible printed circuits, and flat cable for the aerospace, computer and automotive markets.) . . . Fred Leonetti represented M.I.T. at the Inauguration of Gordon Carl Bjork as 18th President of Linfield College in May. Fred lives in Portland, Oregon.

I've joined the faculty at the Whittemore School at the University of New Hampshire and will begin teaching production and operations management there in the fall. It's a long drive up route 95 several times a week, but looks well worth the effort. Since I'll be the only one teaching production, I will design my own course. That ought to keep me out of mischief over the summer. Start planning for next June's get-together, and in the meantime send advance information on your whereabouts to—Linda G. Sprague, 10 Acorn St., Cambridge, Mass. 02139

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Joe Harrington sent me a card which says, in part: "We got back from Vienna last fall. I started with Commonwealth Edison (Evanston, Ill.) on October 2. Since then they've found a wide variety of interesting things for me to do in the general area on nuclear engineering. 'Nuclear fuel management' is, I guess, the best description I can give. Family news: my 2-year-old broke his leg, and my wife presented me with a second son (Robert Mueller H.), in that order, on April 3 and 10 respectively. This plus my Alumni Fund work pretty well accounts for my 'leisure time activities.'" Thanks Joe.

A few days after receiving Joe's card another one appeared. This one was from Al Crisi. I was crushed by my classmates' largesse. Al wrote: "After living in Wiesbaden, Germany, for four and one-half years, my wife, Barbara, and 5-year-old son, Peter, made it back 'Home.' I am no longer Air Force property—received the Air Force Commendation Medal. I'm now working on a teacher's certificate at Colorado State University. We've built a modern ranch home in Estes Park, an ideal small town for raising an active growing boy!"

Pounds Committee

Our man on the Pounds committee is Peter Gray. I met Pete late May just before the preliminary report was due and he looked sleepy. The committee was a full-time job, he said, and full of divergent opinions. Even privately he couldn't say how things were going to come out nor how much weight the report would carry

with the powers that be. My feeling was that Peter was devoting most of his energies to this problem and that the Institute was being well served by one of its more articulate and thoughtful alumni.

Manuel Moreno is on the move again: "After two years in Paris as Manager, Southwestern Europe, for Cooper-Bessemer, I am being transferred to Tokyo in the spring as Manager, Japan and Far East, to establish an office to provide marketing and technical support to our licensees and more fully explore the far-eastern market." Remaining behind in France is **Robert Baschwitz**, who is working for a French company (doesn't say which) that makes nuclear fuel elements, as a research engineer. The card Bob sent was post marked Bournemouth, Pool, England, however. He is "seconded," as they say in France, to the European High temperature Gas Cooled Reactor Project called the Dragon Project (sounds sinister) in Winfrith, England. Closer to home, **Ted** and **Pat Jarmain** are alive and well in London, Ontario, Canada. Ted is "busy developing and managing cable television systems." He is involved in five systems with over 50,000 subscribers. Last May (1968), they had their first kid: Cathrine. The cable television firm is thriving and will soon go public but they seem to be having trouble with some new Canadian regulations.

Andy Buffington was married in June, 1968, to Sally Woodworth, a lovely young lady, from Brewster, Mass. Now they live in Berkeley, risking life and limb so that Andy can work at the Space Sciences Laboratory (a little ivy covered cottage on the main campus as I recall from a visit out there several years ago). Further back in history, **Henry Wagner** married Margurite Lingley of the Peter Bent Brigham Hospital Nursing School just before our graduation. Now they have three kids: Cindy (6), Todd (5) and Jeff (3). Henry has been around. After working for B. F. Goodrich, DuPont and Union Carbide he has finally found a home at Allied Chemical in New York. There he is the Project Manager of the corporate Operations Research. His M.S. in Operations Research from the University of Delaware probably helped him land the job.

Donald Ravey has a "challenging position with the Ampex Corporation, Instrument Division, as Supervisor of Systems and Procedures."

In January there was an article co-authored by **Walter Loveland** in the *IBM Journal of Research Developments* on time sharing in nuclear chemistry. The blurb along with the article said that he received his Ph. and D. in chemistry from the University of Washington in 1966. From 1966 to 1967 he worked at Argonne and then moved on to Oregon State University in Corvallis where he is an Assistant Professor. A press release reports that the Executive Vice President over at Boston Computer Software Corporation is **Leonard Spar**. I read the release cover to cover but I still can't figure out what they sell. I'd love to help you

out Leonard, but you'll just have to spell it out in simple language a biologist can understand. **Leonard Coris**, who works for the National Life Insurance Co., of Vermont, is a member of the firm's President's Club. This, it appears, is an honor. It certainly is a pleasure since it entitled him to an Educational Conference in Nassau, in April. Nice going, Leonard. **Michael Sancho** is an Assistant Professor of Chemistry at Ottawa University in (you guessed it) Ottawa, Kansas.

I never cease to be amazed by some of the outliers on the scale of occupations some of you get into. **Charles Clough** really broke with the old M.I.T. image when he got his Th.M. degree in Semitics and Old Testament, in May 1968, from the Dallas Theological Seminary. Now he is pastor of the Lubbock Bible Church. Quite a switch from Course XVIII. Have a swinging summer and write if you get work.—**Andrew Braun**, 131 Freeman St., Brookline, Mass. 02146

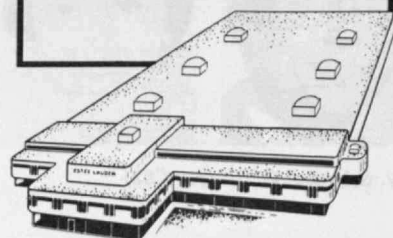
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Communications/Research Machines is a new publishing company which is made up of young blood and thinks young. The company has a staff in Del Mar, Calif., which averages 28 years. The board chairman is **Nicholas H. Charney**, 27, who has his Ph.D. in psychology. The firm is the publisher of the year and a half old *Psychology Today* and also *Careers Today*, circulation of the latter being guaranteed at 500,000 as a starter, and the firm has invested \$1 million to get the subscriptions. *Psychology Today* seeks to relate psychology to everyday life, and its sidekick, *Careers Today*, is seeking to give youth an idea of areas in which they can move their lives. Mr. Charney is from Princeton, N.J., and Newton, Mass., and earned his undergraduate degree from M.I.T. His doctorate came in 1966 and he headed for California where he was to give birth to *Psychology Today*.

An announcement comes to us from the Methodist Church that the Reverend and Mrs. **John O. Stanley** of Maryville, Tenn., are among 18 persons who are being commissioned new missionaries and deaconesses of the United Methodist Church. The Stanleys will go to India to serve in the field of technical and industrial education and Christian education. Reverend Stanley received his B.S. in electrical engineering, at M.I.T., ministerial training at Dallas Theology Seminary, Candler School of Theology, Atlanta, Ga., and received his bachelor of Divinity degree in 1967. Since that time Reverend Stanley has served at various posts, and most recently he and Mrs. Stanley spent five months in training for their overseas post, for which they were to be commissioned on January 12, 1969.

Eugene F. Finkin, well known researcher and consultant, has joined the Fairbanks Morse Power Systems Division of Colt Industries as Chief tribologist where he will direct all research and development relating to friction, wear, lubrication,

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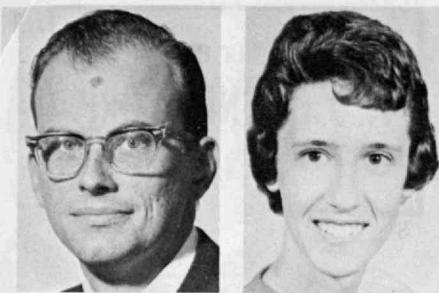
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Rev. & Mrs. J. O. Stanley ('62)

bearings, seals, gears, self-lubricating materials, and related aspects. This segment of technology is a relatively new engineering area and is being called tribology.

Elliott Bayly has joined the staff of the electrical engineering department at Northwestern University, Evanston, Ill. Dr. Bayly is doing research concerned with the information process in part of a crayfish's nervous system and is attempting to duplicate the tail of a crayfish by using an electrical model (thereby gaining knowledge of the physiology of the crayfish's nervous system). He received his B.S. from M.I.T., his M.S. from Stanford University, and his Ph.D. from the University of Minnesota. . . . *Richard H. Bartholomew* has recently joined I.T.T. Data Services of Paramus, N.J. as an applications specialist for computer time sharing services.

White House Assistant

After serving as "special assistant to the President-elect," assigned to coordinating programs and policies for the new administration, that is, sorting out, from among thousands of ideas, proposals, issues and crises, the key programs that President Nixon would undertake when he entered the White House, *Robert Anderson* now serves as White House Assistant. His position resulted from volunteer work which he undertook on some projects and some position papers and memos which he produced. These reports commanded President Nixon's respect, and following his meeting with Nixon, Anderson undertook to head up Nixon's research department where, for a year and a half (including the campaign), he was research director. The Key Issues Committee served primarily as a foil against which Nixon could bounce ideas and get intelligent reactions and constructive steers from practical men in government. It is to be Anderson's job as a White House Assistant to translate policies, plans and programs into terminology that the government can understand and act upon. Anderson graduated in 1957 from Dartmouth, and received simultaneously an M.S. in engineering and business administration from two schools connected with Dartmouth; on a Ford Foundation stipend he received his doctorate at M.I.T. and then became re-

search fellow at the Joint Center for Urban Studies at M.I.T. and Harvard University. Following this, he moved to Columbia in New York as assistant professor of finance, becoming associate professor of housing in 1965. Dr. Anderson's 1964 study on capital investments and how they were being effected by the national Urban Renewal Program became a book of some controversy.

Gilbert Shen is now a graduate student at Berkeley in physics. . . . *Thomas A. Layher* reports that his wife, Mary, presented him with a second son, William Thomas, December, 1968, and also that he is still pursuing systems analysis for Ford Motor Co. . . . *Robert Breuer*, reports that this year he became head of the statewide transportation planning section, New York State Department of Transportation in Albany, N.Y. . . . *Charles Sve* received a Ph.D. in theoretical and applied mechanics from Northwestern University in August, 1968, and is employed at Aerospace Corporation, Los Angeles as a member of the technical staff. He is doing research in structural mechanics. Living in Palo Verde Estates, he enjoys the Southern California climate. . . . Dr. *Robert D. Nassau* completed his first year of pediatric residency this past summer and was called to the air force. Dr. Nassau is now stationed at the L. G. Hanscom Field at Bedford, Mass., for his two years service. —*Gerald L. Katell*, Secretary, 310 Hoge Building, Seattle, Washington 98104

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Summer has arrived and with it the sailing season. I have been out on several races and so far have avoided my occasional bouts with seasickness. This has been a very hectic spring for me as I resigned from E.G.&G. Inc. (after six very good years) and am now at Computer Signals Processors Inc., Burlington Mass., as a Senior Systems Engineer. I would again like to extend an invitation to any classmate in the area to drop by for a drink, and most of all keep those cards and letters coming, so the notes can be kept up to date.

I had two notes from *Michael Schaffer*, one of which was lost in the between

secretary shuffle. In any case, Michael has completed two years in the Peace Corps and has stayed on at the Universidad Technica Del Estado in Santiago, Chile, where he is now a regular professor in the physics department and doing research in liquid levitation in electric and magnetic fields. This was after completing his E.E. Sc.D. at Tech in 1966. He writes, "The scientific community in Chile is small, and communication with the world scientific community is not nearly as good as it could be. Now that I am isolated from it, I realize just how much of our scientific-technical progress really depends on the rapid exchange of information and ideas within the scientific-technical community. The 'brain drain' is not just for economic reasons, but also that one simply cannot work as effectively in isolation."

Pat (Selby) Marzilli writes that she and her husband Luigi have just returned from three and one half years in Australia where they both received their Ph.D.'s in chemistry at the Australian National University in Canberra. And as if that were not enough she further reports, "We turned the trip back to the States into a South Seas vacation and explored the islands of Fiji, Tahiti, Moorea, and the Hawaiian Chain." They are now doing research at the University of Chicago.

Dan Ross writes, "At the moment we are relaxing in Liechtenstein. We started the day in Zurich and drove to the German border, took a ferry across a scenic lake, continued through Germany, along the lake into Austria and Liechtenstein." Dan or I should say Lieutenant Ross is on leave before going to Vietnam in July. He is fulfilling his R.O.T.C. commitment after graduating from the University of Pennsylvania Law School in 1966 where he was on Law Review, and clerking at the U.S. Tax Court. He and his wife Faye (Zerwekh), Wellesley '65, have been living in the Chicago area where Faye teaches.

John Lockie is secretary of the M.I.T. Alumni Club of New York. He is with Trans World Airlines as Manager-Sales Quotas & Analysis. . . . *Philip Marcus* is enrolled in a program at U.C.L.A. leading to a Ph.D. in engineering. . . . *Michael*

Maul is working at Bell Labs, Murray Hill, after receiving his Ph.D. from Tech. He is married to the former June Paradise, M.I.T. '67, who is also at Bell.

John McNally has been promoted to Group Manager Polyester Resins, Koppers Co., Research Department. . . . *John Mc Donald* is a lecturer at Yale, after receiving his Ph.D. from their E.E. department. . . . *Stephen Miller* was married to Christina Gilbert of Northampton, Mass. He graduated from Yale Medical School and has completed his internship in surgery in Boston. He is now at Georgetown University. . . . *Dale Miller* says his Norwegian wife Kari is trying to teach him Norse. They have a son Sven. Dale is working on a Ph.D. in the E.E. department at Berkeley. He received an M.S.E.E. from San Jose State in 1966.

Peter Mlynaryk is Assistant Professor of Finance at California State College, Fullerton, while working toward his Doctorate at U.S.C. . . . *Frank Model* is working for Celanese Research Co., after receiving his Ph.D. in chemistry from Harvard. He and his wife Suzanne report the arrival of a daughter Karen Elizabeth. . . . *Robert H. Morse* received his L.L.B. from Harvard and was admitted to the New York Bar. He is an Associate with the patent law firm of Kenyon & Kenyon in New York City. He has married the former Sandra Goldstein of Marblehead, Mass. . . . *Robert I. Morse* is an Assistant Professor with the department of Chemistry of Clark University, Worcester, Mass. He received a Ph.D. from Yale and was a post doctoral student at U.C.S.D.

A pot-pourri of recent news from the clippings and your letters to the Alumni Fund: *Stuart J. Kurtz* won his Ph.D. in chemical engineering from Princeton on May 8. . . . *John K. Castle* is a Vice President and voting stockholder of Donaldson, Lufkin, and Jenrette, a Wall Street asset manager service company, where most of his work is in corporate mergers and acquisitions. . . . *Mark R. Ordower* is practicing law with the firm of Brown, Fox, and Blumberg, having studied at the University of Chicago Law School after M.I.T.; he and Jane have a baby daughter Stephanie. . . . *Thomas R. Lewis* is now a computer programmer for Prudential In-

surance Company in Newark and is working in the Company's actuarial training program. . . . *Benjamin M. Zucherman*, took his Ph.D. in astronomy from Harvard in June, 1968, was married two months later to the former Phyllis Winston (Wellesley, '67), and after their South American honeymoon has settled down as an Assistant Professor in the Department of Physics and Astronomy at the University of Maryland.

Richard P. Morton, who took his Ph.D. in computer sciences from the University of Pennsylvania in December, 1968, now works at MITRE Corporation in Washington, D.C. His wife Evelyn teaches first grade in Montgomery County, Md. . . . Captain *Elliot B. Koffman*, U.S. Army, reports his third child, Robin Beth, born to Caryn on March 27, 1968; he will leave the Army in September to become Assistant Professor of Electrical Engineering at the University of Connecticut. . . . *Stephen M. Goldfeld* writes that he has just been promoted to Professor of Economics at Princeton, "where I am awaiting the improvement of the scenery which should follow the recent decision to go co-ed." . . . From *A. Martin Fleishman*: "Married, two children (3 years and 3 months), completing internship at the Maine Medical Center, Portland, starting psychiatry residency at Western Psychiatric Institute in Pittsburgh, Pa."

Tom Nelson received an M.S. in Industrial Administration from Carnegie-Mellon University in 1965 and has continued toward the Ph.D. at Sloan. . . . *Richard Olson* is working as a systems analyst for the Chicago Police Department, seeking to apply the techniques of military operations research to police problems. . . . *John Papadopoulos* has been promoted to Staff Engineer of the Components Division of I.B.M.

Sung K. Park writes that he married the former Young -ok Pak in services at the M.I.T. Chapel and they have a daughter Mille. Sung is working on his Ph.D. at the University of Texas in Austin. . . . *Leland H. Perry* reports the birth of a third child Todd and the purchase of a new home in Fanwood, N.J. He is working for Enjay Chemical Co., doing market research receiving his S.M. from the Sloan school in 1965. . . . *Norman Peterson* is Director of

Program development at Hughes Aircraft.

Albert Pirone is the proud father of a boy, his first child. He is working for Atlas Chemical in Wilmington, Del., and soon expects to receive his Ph.D. from Pennsylvania State University. *Stephen Piner* is Vice President in charge of Systems Development at Agrippa-Ord Corp., Carlisle, Mass. They are a computer systems house specializing in the biomedical area. . . . *Michael Platt* is currently an Associate Product Manager for the Jello Division of General Foods in White Plains, N.Y. He is married to the former Linda Glasband. . . . *William Plummer* completed his M.S. in 1966 at Tech and now works for RLE. He reports the birth of a son William, Jr., in 1967. . . . *William R. Pokross* is advancing on a Ph.D. in economics at the University of Pittsburgh.

Alan Rogol is working on a doctorate in physiology and a doctorate in medicine both at Duke University. He was married in 1968 to the former Joanne Schodervek. . . . *Alan Rodger* received a Ph.D. in Chemical Engineering from Queens University Kingston Ontario. . . . *Barry Rosof* reports that he finally made it out of M.I.T. He had the pleasure of watching the rest of the faculty vote on his degree. . . . *James Ruttenberg* was married in 1968 to the former Phyllis Yoken of Providence, R.I. He is a systems analyst with I.B.M. in Rockville, Md. . . . *Timothy M. Sloat* married Mollie Hughes of San Antonio, Texas, and they have one son. Timothy is working on his Ph.D. at U.S.C. in aerospace engineering.—*Martin Schrage*, Secretary, 305 Massachusetts Ave., Arlington, Mass. 02174

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The deadline for this issue is prior to our reunion, so a full report will come in the next *Review*, this fall. In the meantime, all news items will be greatly appreciated. The Class Hero of the month, with Oak Clusters, is *Jerry Weiner*. This title is reserved for those who not only write a personal letter to the secretary, but also include news about other classmates. Jerry is manager of a Ft. Worth company making carnival rides. He is in production on his first thrill ride, the Vegas Chase,

albert

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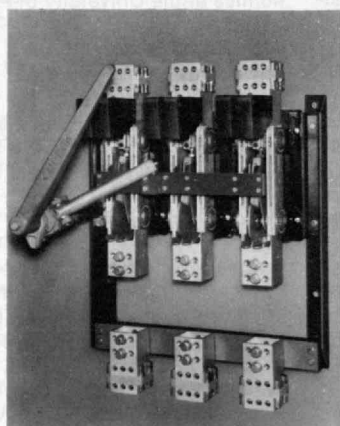
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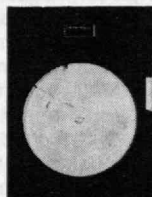
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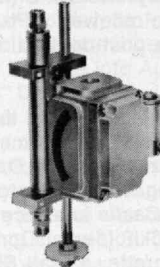
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which will be out this fall. He notes that *Dan Frischmuth* has left Ft. Worth and is now working for Hewlett-Packard in California, and also reports a visit by *Joe Kasper* who was on his way to deliver a paper in Houston.

Mark Ain received his M.B.A. in marketing at Rochester in 1967, and is now working for Digital Equipment Corp., in Maynard, Mass. . . . *Walter Anderson* is the proud father of his first child, Eric Michael, born December 11, 1968. . . . *Tom Arnold* is a programming group supervisor at Bell Labs in Holmdel. He received his Sc.D. from Columbia this June.

Arthur Best is a senior engineer for A.A.I. Corp. in Cockeysville, Md. His present assignment involves heading up a group of engineers at Tyndall A.F.B. in Panama City, Fla. . . . *Barry Blesser* was co-author of an article in the December 1968 issue of an I.E.E.E. publication concerning feedback control systems. . . . *Charles Counselman* has been promoted to assistant professor in geology and geophysics at M.I.T. . . . *John Downie* is eagerly awaiting his discharge from the Army this August. . . . *Roger Humphrey* received his Sc.D. in mechanical engineering at M.I.T. this year, and is now on the staff of Shell Development Co., in Emeryville, Calif. . . . *Duncan Miller* also received his Sc.D. from M.I.T. in mechanical engineering this year, and is now working for Bolt, Beranek & Newman, Inc., in Cambridge. . . . *Dennis Smith* is working at the Space Science Lab at Berkeley, participating in a group involved with lunar sample analysis for N.A.S.A. . . . *J. W. Wesolawski* has been appointed managing director of E. R. Squibb & Sons-Uruguay, after having been their sales manager for three years in the Caribbean area. . . . That's all the news for this issue. I hope you are all having a pleasant summer.—*Ron Gilman*, Secretary, 1021 Oakmont Pl., Apt. 8, Memphis, Tenn. 38107

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Dick Tsien is continuing his research on the biophysics of heart cell membranes at Oxford. In the summer of 1970, he'll be returning to be an assistant professor at Yale Medical School. . . . *Bill Samuels* has just finished his Army Reserve tour of duty after completing his degree at Harvard Law School. . . . *Joe Fogel* is doing foamed polystyrene research at Koppers Company.

The *Phil Smiths* are expecting their first child in June. Phil is currently Program Administrator of the Sentinel Division of Burndy Corporation. . . . *Dennis Bekeny* is now pursuing an M.D. at Case Western Reserve, having finished his S.M. in Nutritional Biochemistry at M.I.T. . . . *Gene Chase* is teaching at Wells College while completing his Ph.D. in Mathematics at Cornell. . . . *Barry Wessler* recently completed his second round-the-world trip working at A.R.P.A. . . . *Victor Godin* received his D.B.A. from the Harvard Business School in March and is now an

assistant professor at Rensselaer. . . . *Joe Nay* is working at the Systems Evaluation Division of the Institute for Defense Analysis in Arlington, Va. . . . *Pat Dawe* received his master's in city planning from the University of Pennsylvania and is now working for the Philadelphia Model Cities program.

Frank De Remer married the former Miss Sherry Lynn Gulman, M.I.T. '68, last September. Frank is now finishing up his Ph.D. work in computer science at M.I.T. . . . *Howard Mandelbaum* is the Manager of Marketing Research for the U.S.V. Pharmaceutical Corp., and is also teaching part-time at Fairleigh Dickinson University. . . . *Emile Sabga* is teaching civil engineering at the University of the West Indies as well as having his own consulting practice. The Sabgas are now expecting their second child. . . . *Marshall Slemrod* will receive his Ph.D. in applied mathematics this June from Brown and will become a research associate there. . . . *Archie Bleyer* will graduate from the University of Rochester this June with an M.D. degree and will start internship at the University of Washington in Seattle.

Ron Mandel is now in New York in the Institutional Research Department of Oppenheimer and Co. . . . *Bill Kavesch* has started internship at the Boston Public Health Service Hospital. . . . *Bob Reichelt* spent two years in the Peace Corps in the Philippines and is now finishing a master's degree at the Sloan School. . . . *Michael Graham* was married in June, 1968, and is currently working on a Ph.D. in biophysics at Berkeley. . . . *Dave Carrier* finished his Sc.D. in October and is now working on lunar soil mechanics at the Manned Spacecraft Center. The Carriers also report the birth of a daughter, Bettina Noelle in March. . . . *Larry Hill* appears to have recovered enough from recent injuries to resume his former positions at Control Data, Suffolk Downs and the F&T. . . . *Karen Kolling* is now a programmer at the Digital Equipment Corp., in Maynard, Mass.

John Beckman writes that he has passed his C.P.A. exams and that he is coordinating financial planning on some of Westinghouse's government proposal work. The Beckmans are expecting their first child at the end of this summer. John also reports that *Jerry Saxon* was married to the former Miss Roberta Pollack and that Ken Ross was married to the former Miss Marde Gardner in December. The Ross's are settling in Mountain View, Calif., where Ken is working at Raychem Corporation.—*Jim Wolf*, Secretary, Brigham Road, Gates Mills, Ohio, 44040

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Having just returned from an exciting weekend in Marrakech at Morocco's National Folklore Festival I found a formidable looking packet of clippings and items from *Technology Review* and a rapidly approaching copy deadline. So here I am again. Incidentally, these

packets of goodies arrive regularly from *Technology Review*, but, unfortunately, letters from classmates are much more scarce. Then there's that joke about M.I.T. graduates not being able to write. Hell, send numbers if you wish. I'll print anything.

Rod Peterson married the former Miss Mary Kay Brincko, Newton College of the Sacred Heart '66, last September. Rod has been promoted to Planning Staff Supervisor of the Hull Outfitting Division at the Newport News Shipbuilding & Drydock Co. . . . *Ron Banducci*, S.M., married Sue Lucas on May 3 in Richmond, Calif.; he's now employed as a process engineer at the Martiney Refinery of Shell Oil Co. . . . In March of 1968 *Sheldon Bayer* married Jackie Plimmer of Washington University. They were expecting this June to receive both their first child and Sheldon's masters in electrical engineering from Washington University. He has been working on information display upon plasma panels. . . . And, as always, there were a few June marriages. *Richard Koehler* and Pam Dresen, a student at the College of Holy Names in Oakland, were married June 7. Richard has been working on his Ph.D. in Electrical Engineering at Stanford. . . . *John Lindley* married Cynthia Thorson on June 1, 1968. They are living in Seal Beach, Calif., while John is employed as an aeronautical engineer at Douglas Aircraft Company in Long Beach. . . . *Lawrence Risman* and the former Miss Toby Wilson had a wedding in New York City on June 29. He has received his M.A. in mathematics from Harvard and is working both towards his Ph.D. and Instructor of Mathematics certification at Fitchburg State College in Massachusetts.

Richard Rush, a Peace Corps Volunteer in Ivory Coast, writes that he is helping construct concrete block houses for a small village near the Ghana border. . . . *Bertram Noyes* received his mechanical engineering degree from M.I.T. in June.

David Leary is a graduate student at Berkeley in the chemical engineering department. . . . *George Thomas*, having completed postdoctoral research in the Department of Biophysics, King's College, London, has accepted a position as Assistant Professor of Chemistry, South-eastern Massachusetts Technological Institute. . . . With the completion of his thesis this summer, *Ephraim McLean*, S.M., will be off to the Graduate School of Business Administration, U.C.L.A., as Assistant Professor of Information Systems. . . . *Jerome Milch* is working toward his Ph.D. in Political Science at M.I.T. *John Ellenwood*, Associate Research Engineer with Boeing, is working in wind tunnel testing at the Boeing transonic, supersonic, and low speed research wind tunnels. . . . *Bob Katz* has joined the Digital Equipment Corporation, Maynard, Mass., as an industrial marketing specialist.

Stuart Schaffner, who is with I.B.M. as a systems programmer, writes that Poughkeepsie is a real drag, but that I.B.M. is



Howard Evans, '67

nice if you don't mind working like hell. . . . *Chiway Hsiung* formed an office, "Atelier Cambridge," in June, 1968, with six partners. It offers research and professional services in architecture and planning. . . . *Doug Halley* received his masters in aeronautical engineering from Princeton last August and is presently working as an aeronautical design engineer at Sikorsky Aircraft, Stratford, Conn.

Well, I have to apologize for complaining about lack of letters from classmates; the day's mail just arrived, and I was happy to see that the curve of "Number of Letters Received From Classmates" took a violent upswing—meaning, of course, that I received one letter. Thank you, *Dick Gauthier*. He writes that he will soon finish his two years in the Peace Corps in Ghana and that he will be traveling back to the U.S. via Cairo, Beirut, and Europe. Dick has been accepted for a Physics Ph.D. program at the University of Illinois, Urbana, with a half-time teaching assistantship. He also writes that *Steve Weiss* and wife are in Ghana.

Mel Snyder says that somebody should do something to straighten out *Neal Gilman*. . . . *Roy Gamse* is in the systems analysis department at MITRE and taking graduate courses part-time. . . . *Terry Collins* is working at Naval Research Laboratory. . . . *Larry Galpin*, a research engineer for Dupont in Wilmington, Delaware, is involved in several sports, in particular with a soccer club. He's planning to spend a week on a schooner in the Caribbean this summer. He's also going to night school. . . . *Bob Domnitz* is currently working on Communication Satellites at Lincoln Lab. . . . *Bob Ferrara* recently began working for Peat, Marwick, Livingston & Co. in the Prudential Center, after receiving his M.B.A. from Harvard Business School.

Dave Garbin is in the U.S.A.F. . . . Lt. *Lawrence Laine* is stationed at Portsmouth Naval Shipyard, N.H. . . . *Neil Daykin* is in Vietnam. . . . First Lieutenant *Joseph Sullivan* has been named Outstanding Junior Officer of the Year in his unit at Anaheim, California. Joe, an astronautical guidance and control engineer with the Air Force Contract Management Division, is assigned to a unit of the

Air Force Systems Command. . . . *Von Kays* has been promoted to first lieutenant in the U.S. Air Force. He's a base civil engineer at Loring AFB, Maine, and is assigned to a unit of the Strategic Air Command. . . . Second Lieutenant *Howard Evans* has been awarded silver wings upon graduation from the U.S. Air Force navigator school at Mather AFB, California.

I regret to report the deaths of two of our classmates. *Jay Davidow* died in a car accident in February. He had been on the staff of the Georgia Tech Computer Sciences Department. *Kenneth Bright* died of leukemia in Boston on February 21. He had barely commenced graduate school at Brandeis University when his illness was detected in the fall of 1967. Since then, he lived in Framingham concerning himself mainly with music between periods of treatment in the hospital. His death culminated a determined struggle to survive despite the odds he knew he faced, for which we can only have great respect. Our deepest sympathy goes to Jay's and Ken's loved ones.—*Jim Swanson*, Secretary, Services Provinciaux, Beni-Mallal, Morocco

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The news for this month falls into two basic categories: those people who are getting married and those who are getting drafted. This seems to be a sign of the times. As far as I know these sets are disjoint; however, my readers like to disprove me. In the April issue I said that *Doug Wilson* was the first in the class to be drafted, since then I have received many notes from others in uniform including one person who claimed an earlier induction date. However, this topic can get depressing so let's get on to the social news first.

First I'd like to report that four coeds have caught their guys, two of whom are also in the Class of '68. *Linda Mammen* and *Mike Tashker* were married last September. Mike is a graduate student at Stanford and Linda is working in the area. *Keith Kallberg* married *Razel Wittels* on February 1. Razel has received an S.M. in geology and Keith is an R.A. in Course I working on his S.M. thesis.

Gail Gullledge was wed to Andy Hanson on December 27. He is a Harvard graduate and is now working for a Ph.D. in Course VIII, as is Gail. *Margaret Buck* is engaged to Richard St. Peters, '65, and plans to be married this August. She is finishing up an M.S. at Northeastern in Physics while Dick plans to receive a Ph.D. in Course VIII soon.

Jack Russell writes that he married the former *Holly Arnold*. He has received a Grumman Master's Fellowship at Brooklyn Poly in polymeric materials and is also doing materials research at Grumman. . . . *John Moffatt* is married to the former *Vivian Mason* and he reports that they have an 18-months-old son, Sean. He is currently a senior programmer with Service Technology Corp., a subsidiary of LTV-Aerospace, on contract to NASA-ERC in Cambridge. . . . *Jeff Stokes* proposed to Susan Finlay of New York City on New Year's Eve. Jeff is working on a Ph.D. in Physics at Berkeley; however, this may change since he has a I-A now.

Finally, *Bob Mc Crory* plans to wed *Betsey Wahl* of Eau Claire, Wisc., on June 5. Bob is studying in Course 22 and Betsey will graduate from Simmons in June and study at the New England Conservatory next year. . . . *John Dehne* was married on June 9, 1968, to the former *Carol Hersh*, B.U. '68. He is working as a physicist for the U.S. Army Electronics Command, Ft. Monmouth, N.J. and they are living two blocks from the beach in Long Branch.

"You're in the Army Now"

As mentioned before, the honor of being the first person in the Class to be drafted is being hotly contested. However, *Pete Van Sickle* appears to have a definite lead. He was supposed to start graduate work in physics at Berkeley in September, however the Barron, Wisc., draft board felt differently and ordered his induction early in October. He is now part of a Fire Direction Center of a platoon of 4.2-inch mortars in the Mekong Delta near Vinh Kim. . . . *Peter Rode* was able to complete one semester of political science at the University of Wisconsin before being drafted on February 3. He writes that he has no intention of staying in the Army more than two years and plans to return to school. . . . *Lynn*

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(Wiesenberger) Bruneau reports that her husband, Bob Bruneau, '67, was drafted on April 16. He was working on a Ph.D. at Penn State and had a year and a half to go. She recently spent 3 weeks at an I.B.M. school in Washington and now plans to move to Chicago. . . . Due to Selective Service, *Larry Rosenberger* is in basic training at Ft. Lewis, Washington.

Robert Terry is currently stationed at Ft. Monmouth, N.J., engaged in becoming a microwave radio repairman. In case anyone is curious, he writes that "the details of Army life are, of course, not worthy of mention." . . . *George Brooks* is now stationed at Fort Ord, California where he is an Sp. 4, working as a social worker in the Army Medical Corps. . . . *Paul Johnson* finished a semester at Carnegie-Mellon in Computer Science before he was drafted. However, his case is different from those previously cited. Because he was classified a Conscientious Objector, he is now serving his two years as a programmer at the Massachusetts General Hospital.

Paul Ware will graduate from the Engineer Officer Candidate School at Ft. Belvoir, Va. on July 25, but does not yet know what branch of the Army he will be commissioned in. . . . *Gordon Logan* graduated on May 15 from AF OTS at Lackland AFB, Texas, and plans to go to pilot training for a year. He previously had a II-A as a project engineer with Dow Badische Co., of Williamsburg, Va. . . . *Mark McNamee* has joined the Army National Guard and went on active duty April 14 for four months. He plans to go to Stanford to study chemistry. . . . *Robert Yingling* is presently a 1st Lt. in the U.S.A.F. and is working as a Flight Engineer in the Avionics Lab at Wright-Patterson A.F.B. . . . *Jack Rector* has received a commission as an Ensign in the Navy and is in flight training as a Naval Aviator. . . . *Art Cole*, who received a commission through A.F.R.O.T.C., has received orders to go to McGuire A.F.B., N.J., after he finishes his S.M. in Course I. . . . And finally I hear from the Alumni Association that *Joseph Olsen* now prefixes his name with the title 2nd Lt.; I take this to mean the obvious.

Glenn Veeder writes that he is in graduate school at Caltech. He reports that the M.I.T. of the West is building a new solar observatory in (sic) Big Bear Lake. It was planned that the lake would rise in the spring and a boat would then be necessary to get to the observatory. However, before the dome and telescope were installed, the January deluge of rain made it 500' from shore. (By the way, the observatory was built out in the lake because the water keeps the air over it cool, which stabilizes it and improves daytime seeing.) Glenn plans to spend part of the summer at the solar observatory and the rest at the 18" Schmidt telescope on Mt. Palomar working on a search for supernovae.

Art Kalotkin is studying at the U.C.L.A. Department of Chemistry. He reports that

he is still taking pictures on the side to keep sane and thinks that he is safe to continue for a Ph.D. because he received a I-Y. . . . *David Ilfeld* is now at Harvard Medical School. . . . *William Klein* writes that he is "thoroughly enamored of Southern California" and very pleased with the molecular biology department at U.C.L.A. where he is working on a thesis about mitochondrial membranes under Dr. P. D. Boyer. . . . *Mark Bolotin* is going for a Ph.D. in number theory at Ohio State. After much haggling he obtained a II-A for full time teaching duties as a lecturer. . . . *Stephen Straus* reports that he is a first year medical student at Columbia University College of Physicians and Surgeons. . . . *Thomas Romer* is a graduate student in Economics at Yale and plans to spend the summer as a research assistant with the Bank of Canada. (I hope they pay their R.A.'s better than M.I.T. does.) . . . And *Julian Williams*, Course V, writes that he is working on a Ph.D. in comparative biochemistry and had an article in the April *Journal of Organic Chemistry*.

Aureo Andino is teaching first year architectural design at the University of Puerto Rico and has been elected Secretary of the Faculty of Architecture there. . . . *Charles Thomas* is now involved with sonic boom research at N.A.S.A.-Ames Research Center. . . . *K.C. Huang* is working for N.A.S.A.-ERC in Cambridge. . . . *Felipe Ochoa-Rosso*, I, writes that he returned to Mexico in July 1968 and is Director and a partner of IPE SA, a consulting engineering firm, as well as teaching optimization courses at the Graduate School of Engineering of the University of Mexico. . . . *J. Scott Armstrong*, XV, is an Assistant Professor of Marketing at the Wharton School, University of Pennsylvania. . . . *Paul Konnersman*, XV, has a consulting firm in Boston called Growth Management Services.

Lissy in Alaska

We've received a very interesting letter from *Lissy Quinlan* who, as we reported last month, has been studying at the University of Alaska in Fairbanks. Last summer she was a T.A. in an N.S.F. sponsored research training course in oceanography near Juneau. For fun, she writes, they explored old gold mines, climbed mountains, ventured onto glaciers, and worked on the water. The high point was a training cruise on the *RV/Acona* north into Glacier Bay to do some oceanography amid the icebergs of the fjord system. She hopes to receive an M.S. in physical oceanography in August with her thesis consisting of "both a qualitative and a quantitative description of the water masses in Glacier Bay, the Muir Inlet, and two glaciated fjords in southeastern Alaska." Then for a change of climate she will go to the wedding of Amy Shigemoto, '69, and Don Fujimoto, '69, in Honolulu. After all this her future plans sound relatively mundane: she hopes to work on a Ph.D. in the Boston area in either physical oceanography or coastal engineering in the area of coastal and estuarine pollution and environmental control.

Lissy lists the following shocking experiences she had in Fairbanks: first snow September 20, lowest temperature about -60°F., 5 consecutive weeks of -60° to -40°, moose outside the dorm, and earthquakes all the time—the worst was a 6.5 on October 20. However, she also lists the following awe-inspiring events: glaciers, spectacular sunrises and sunsets every day during winter and late fall, caribou migrations, the aurora, and the earthquakes.

Now we have a break in writing the column until the October/November issue; we hope you have enjoyed reading the class notes and would like to thank all those who have written us in the past year for their contributions. We are spending the summer in Asbury Park, N.J.—*Gail* and *Mike Marcus*, Secretaries, Apt. 8, 510 5th Ave., Asbury Park, N.J. (until 9/15); 60 Wadsworth St., Cambridge, Mass. 02142 (after 9/15)

Course Review

Copy for this issue of Technology Review was due from your Secretary on May 20. Information reaching him after that date will be reported in the first issue of Volume 72, October/November, 1969.

VI

Robert R. Everett, S.M. '43, has been elected President and Chief Executive Officer of the MITRE Corporation of Bedford, Mass. He was also named to the Board of Trustees and membership in the Board's Executive Committee. One of the founders of MITRE in 1958, he was its first Technical Director and has held the post of Vice President, Technical Operations since 1959. Entering M.I.T. in 1942 as a Phi Beta Kappa from Duke University, he became affiliated with the Servomechanisms Laboratory and was active in the development of stabilized shipboard radar antennas. As assistant to *Jay W. Forrester, S.M. '45*, he designed the logic and later participated in the development of one of the world's first high-speed general-purpose digital computers, Whirlwind I. Mr. Everett rose through the positions of Associate Director of the M.I.T. Digital Computer Laboratory, Head of the Computer Division of Lincoln Laboratory and member of the Lincoln Laboratory Steering Committee. While at Lincoln and later at MITRE he was responsible for the design and test effort on the SAGE air defense system.

Louis B. Lambert, S.M. '52, has been appointed Vice President for Institute Development at Riverside Research Institute in New York City. Formerly the Columbia University Electronic Research Laboratories, this Institute is a not-for-profit science and engineering organization which, after its first year as an independent entity, has expanded and realigned its management staff to bring it into focus with new areas of interest. Dr. Lambert will be responsible for further development of Institute research, mainly in the directions of societal studies and medical engineering. In addition to his vice presidency, he is also Acting Director of Societal Studies. During his M.I.T. graduate program, he held a Research Assistantship in the Research Laboratory of Electronics; while in his doctoral program at Columbia he was an Instructor in electrical engineering.

Charles A. Desoer, Sc.D. '53, and **Ernest S. Kuh, S.M. '50**, have just published a new book *Basic Circuit Theory*, McGraw-Hill, 1969. The authors say in their

preface, "The most important feature of this book is a novel formulation of lumped-circuit theory which accommodates linear and nonlinear, time-invariant and time-varying, and passive and active circuits." The exposition is clear and precise; many examples are worked out and plenty of problems are included for student practice. The 876-page treatise has been thoroughly tested at Berkeley and at other schools through use of notes and a preliminary two-volume edition. Professor Kuh (Stanford Ph.D. '52) is Chairman of the Department of Electrical Engineering and Computer Sciences at the University of California (Berkeley) and is preparing for a one-year sabbatical leave at the University of Osaka, Japan. Professor Desoer's specialty at Berkeley is system theory.

Nathaniel W. Trembath, S.M. '53, has been appointed Assistant Manager of the Electronic Information Systems Operations of TRW's Systems Group, Redondo Beach, California, according to an announcement in February by Operations Manager *Richard C. Booton, Jr., Sc.D. '52*. Trembath has been Project Manager for the Apollo Lunar Module Abort Guidance System (LM/AGS) Project since its inception in 1964 and will continue as acting manager in addition to his new assignment. The LM/AGS was tested for the first time in space during the Apollo 9 mission. At M.I.T. he was a research engineer and assistant section head in M.I.T.'s Dynamic Analysis and Control Laboratory before going to TRW in 1956. His undergraduate work was done at Bucknell University.

Roger A. Holmes, S.M. '58, Associate Professor of Electrical Engineering at Purdue University, is the Program Leader of the Physical Measurements Group at the Laboratory for Agricultural Remote Sensing. A paper in the April *IEEE Proceedings* describes an electronic observation and data-processing system in which airborne or satellite acquisition instruments collect radiance data from the earth's surface and transmit these data to a ground-based data-processing station. In this way maps can be constructed showing areas of green vegetation as contrasted with soil or water, or more complex classifications such as variations in soil types or in kinds of

vegetation can be studied. As a member of the Solid State Devices Group, his research covers a wide range of automatic control, electronics, and plasma physics applications. Graduated as top man in his class at the U.S. Coast Guard Academy in 1953, Lieutenant Holmes came to M.I.T. for graduate study in the summer of 1955. He is remembered at M.I.T. as a superlative Teaching Assistant and in 1958 was invited by Professor *Thomas F. Jones (Sc.D. '52)* to enter upon doctoral studies at Purdue University where Professor Jones was the new Head of the electrical engineering department. Holmes received the Ph.D. degree in 1962.

Byron L. Johnson, S.M. '60, has been elected President of High Voltage Power Corporation, a wholly owned subsidiary of High Voltage Engineering Corporation of Burlington, Mass. He was instrumental in the formation of High Voltage Power in 1967 and became its General Manager; in 1968, he became the corporation's Vice President.

James L. Massey, S.M. '60, Ph.D. '62, a Professor of Electrical Engineering at Notre Dame University, is in the midst of an innovative and exciting curriculum reform in the School of Engineering. According to the *Notre Dame Technical Review*, he is a member of the Engineering College Council and heads the freshman program in engineering. A common-core curriculum is being designed for students in all the engineering disciplines. The proposed curriculum will be submitted to the student professional societies to encourage the faculty and students of each department to react constructively. Professor Massey is currently giving a subject, Engineering 15, which will become the freshman engineering subject in the new curriculum. The main purpose of the introductory course is to give the freshman student a taste of actual engineering so that he may find out the kinds of problems encountered in engineering practice. Computers are used in the freshman year, and the schedules of all years of the new curriculum will allow free time for students to do practical work with the professors. Dr. Massey's field of specialization is coding theory, a main branch of information theory.



R. R. Everett, Course VI

Hopeful signs

Following is the major portion of a letter from Professor *Jaswant G. Krishnayya*, S.M.'60, E.E. '61, of the Indian Institute of Management, Ahmedabad, India. "I am happy to report that after three years in India I not only feel satisfied with what has been done but am very hopeful for the future. More and more, especially in government, errors are being faced up to, and problem-solving and analytic skills are being sought after now, and permitted, even encouraged, to tackle the maze of sub-optimal systems that exist. Provided one is patient with the structural infirmities of bureaucracy—and recognizes the virtues it has (especially discipline and survivability), one can begin to use leverage to make the system improve. We are fortunate in India in still having an elitist civil service because when a good idea is 'sold,' it propagates rapidly through the decision-making echelons. This is what is now happening in respect of systems analysis methods and new ideas in logistics. At the Institute, for example, we now have more requests for task force studies and recommendations from large operating agencies and industrial enterprises than we can handle. By way of pleasant counterpoint, we are doing a series of systems studies for the development of tourism. We have also made a start in modeling aspects of the Family Planning Program. Though there are just barely 100 computers in India, and the software business is nonexistent yet, we find simulation techniques helpful in explaining the shortfalls of old systems and the advantages of other methods, and the 120 M.B.A.'s we graduate each year are spreading the word! Unfortunately, there is a dark side to this! We may have oversold systems analysis without having the manpower to follow through on the tasks! However we are hoping that the bait of varied and useful work will attract to India some of the experienced engineer-economist analysts now working abroad. Taken all together, this is a great place to be." Professor Krishnayya signs off with "Warm regards," and the footnote, "No kidding, it is 113°F in the shade today."

Nelson E. Chang, S.M.'45, is an engineer in the Distribution Engineering Department of the Long Island Lighting

Company. . . . *J. Clair Callaghan*, S.M.'64, is Associate Professor and Chairman of the electrical engineering department at Sir George Williams University, Montreal, Canada. He was formerly on the faculty at Nova Scotia Technical College. . . . *Israel Bar-David*, Sc.D.'65, is with the Scientific Department, Ministry of Defense, Israel, and Adjunct of the faculty of electrical engineering at the Technion. . . . *Henry F. Ledgard*, S.M.'65, Ph.D.'69, is at Oxford University for a year at The Computer Laboratory. . . . *William J. Mitchell, Jr.*, S.M.'68, is in the Digital Transmission Laboratory of Bell Telephone Laboratories, Holmdel, N.J.—*Karl L. Wildes*, Correspondent, Room 10-303A, M.I.T., Cambridge, Mass. 02139

XIII-A

Wallace H. Garrett, S.M.'46, has joined the staff of Harbridge House, Inc., Boston, Mass., an international management consulting firm. Hank will have responsibility for integrated consulting services in the field of shipbuilding and ship repair. Prior to joining Harbridge House, Hank was DX/DXG project manager in the Naval Ship Systems Command, planning, organizing and directing the 4-billion dollar destroyer fleet replacement program from initial concept through contract awards.

Captain *William R. Porter*, U.S.N., Nav.E. '55, is currently assigned as Staff Assistant to the Commander, Naval Ship Systems Command. Bill visited M.I.T. in March to deliver a seminar on Engineering Economics and Effectiveness to the department. Bill also spent time with the XIII-A officers, bringing them up to date on developments in Washington.

Lieutenant Commander *William Freakes*, U.S.N., Nav. E.'66, is currently Planning Officer, Office of Supervisor of Shipbuilding, U.S.N., Newport News. Bill was co-author of a paper titled *Managing Complex Ship Overhauls* which was presented recently at the Hampton Roads Section, S.N.A.M.E.

Captain *William M. Nicholson*, U.S.N., M.S.'48, is currently Head, Deep Submergence Systems Project. Mack has been

active presenting papers on his project. His paper, *Deep Submergence Systems Project* was presented to a joint meeting of the Structural Engineers Society of southern California, the Society of American Military Engineers and the American Society of Civil Engineers. In addition, he was co-author of *The Effect of Electronics on Deep Submergence Design* presented at the annual meeting of the American Society of Naval Engineers.

More than seventy-five XIII-A graduates were seen at the annual meeting of the American Society of Naval Engineers in May. Rear Admiral *Frank C. Jones*, U.S.N., M.S.'43, Vice Commander, Naval Ship Systems Command and President of the Society, presided throughout the meeting. Among the head table guests were the following Course graduates: *Bill Brockett*, M.S.'43; Rear Admiral *Doug Henderson*, U.S.C.G., M.S.'43; *Mike Honsinger*, M.S.'32; *Jimmie James*, MS.'33; Rear Admiral *Frank Jones*, U.S.N., M.S.'43, and *John Oren*, M.S.'42. —*Robert E. Stark*, Correspondent, 64 Pine Way, New Providence, N.J. 07974

Sloan

John W. Anderson, '67, has been promoted to Vice President-Research and Engineering by Sylvania Electric Products, Inc. Mr. Anderson, who joined Sylvania in 1954, had been executive assistant to the president of General Telephone and Electronic Laboratories since 1967. . . . *William S. Wheeler*, '54, has been named Vice President and General Manager, Communication Systems Division, Sylvania Electronic Systems in Waltham, Mass. . . . *James I. Spiegel*, '64, joined Gulf & Western Industries, Inc., Stamford, Conn., in November 1968. As Group Vice President, Eastern Manufacturing, he is responsible for several of their companies located on the East Coast. He describes these companies as "typically diversified ranging from wire and cable to musical instruments and publications." Mr. Spiegel reports that he and his family are happy to be back in New England. . . . *Endre Endresen, Jr.*, '62, has become Vice President-Operations at Ocean Spray Cranberries, Inc.

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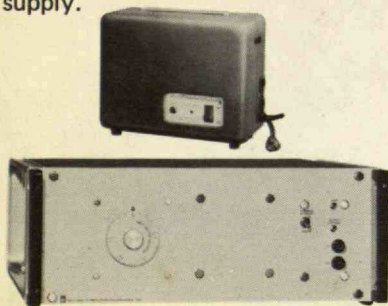
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